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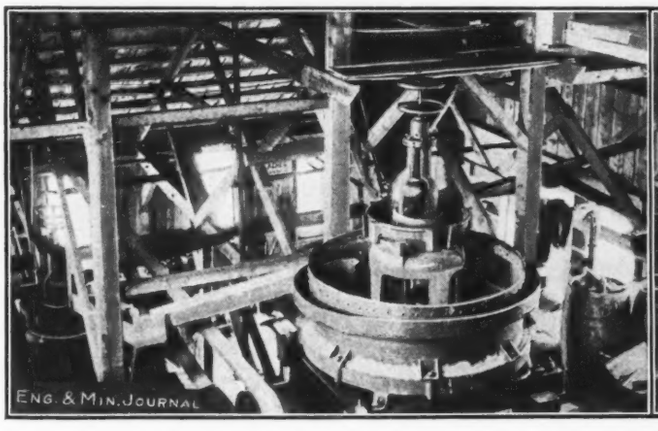
Requirements of Small Cyanide Mills

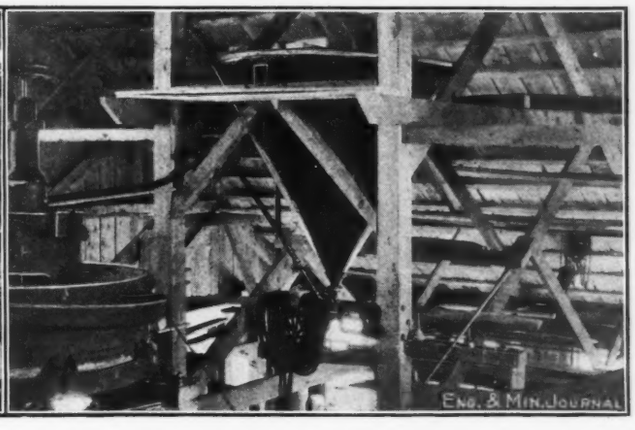
By Algernon Del Mar*

SYNOPSIS—A discussion of ways and means of constructing small cyanide plants in the presence of money scarcity. Comparison of the machinery which may be adapted to such cases with that installed in large, expensively constructed installations. Special emphasis is placed upon grinding pans to replace the usual tube mill.

One of the most difficult problems confronting the metallurgical engineer is the designing of all-sliming plants for mills of small size or for mining companies of limited means. As most of the free-gold ores in the United States yield a fair percentage of the gold content by amalgamation, this process must usually precede cyanide treatment.



Grinding Pan Installed



Callow Cone for Thickening

Several Machines for Same Work

It is known to the practical worker in the field covered by this article that the most useful machines for crushing ores are rockbreakers, rolls, stamps, pans, chilean mills, and tube mills and that each type of machine has its greatest usefulness in crushing particles of ore of certain sizes to certain other sizes. To take the most notable comparison, the rockbreaker would not be used for crushing particles of any size to 200 mesh, any more than would the tube mill be recommended for crushing masses of ore to 2-in. cubes. There are, however, some machines that come so close to doing the same quality of work, as with rolls, stamps and chilean mills, that the choice is at times a difficult one and these machines often compete. The chilean mill probably has the widest range of usefulness, for it competes with rolls, stamps, pans and tube mills.

First Cost a Compelling Factor

In designing a mill for a company whose finances are limited, we must choose the cheapest form of grinding machine, not only in first cost, but in the cost of repairs and renewals, that will do the work. We eliminate rolls, for our ores are usually damp and contain a certain amount of clay and also because, with rolls, an amalgamating scheme is at a disadvantage. We must have a rockbreaker of small size, so we begin with this. One rockbreaker is of little use in crushing to smaller than 1-in. cubes, so we must follow with a machine capable of taking large lumps of ore and crushing to such a size that the following machine will deliver a product fine enough for treatment in the all-sliming plant. Our choice lies between stamps and chilean mills. Ball mills will not be considered, as they have not proved their ability to compete with the others. A stamp mill, in my experience, performs its best work on ore particles larger than economical for a chilean and delivers a somewhat coarser product. As the chilean is a good amalgamator, the choice between the stamps and chileans is more or less determined by the size of the rockbreaker product. The first cost is in favor of the chilean.

Having now our rockbreaker and intermediate machine, either stamps or chilean, according to individual

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fancy, and as far as I am concerned it would be the former, we must now choose our fine-grinding machine. We will take for granted that preliminary tests have shown that the amount of extraction of the precious metals depends upon the fineness to which the ore is ground, for otherwise an all-sliming plant might not be necessary.

We now come to the machines that will do the fine grinding and the choice lies between chileans, pans and tube mills. Of the latter, there are the conical and the cylindrical types, these occupying positions which overlap in the center of the scale, say, between 40 and 200 mesh, each being more efficient at one end of the scale, the conical between 40 and 100 and the long cylindrical between 100 and 200 mesh. The chilean, not being able to make a 200-mesh product with economy, is discarded, so that our choice lies between the pans and the cylindrical tube mill. There is no doubt of our preference being for the tube mill, but here the question of first cost for machine, transmission machinery and motor to drive it must be the deciding factor and for a company of small means, the tube mill is out of the question, so we fall back upon pans as being the most suitable, but perhaps not the most economical, although this is open to argument.

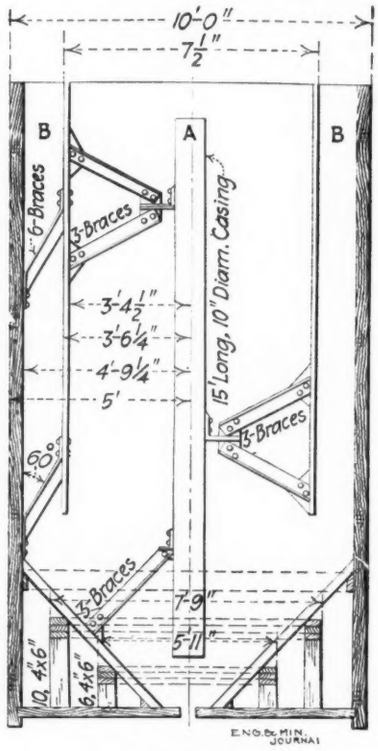
Pans do good work if the pulp is thickened before entering them, but do little or no work with a dilute pulp, for then the coarse particles separate from the mass, the centrifugal force sending them to the periphery of the pan, where they escape in the overflow, while the finer particles, needing the least grinding, settle to the bottom. By taking the pulp from the center of the pan instead of at the periphery, this condition may be somewhat corrected, but the separation of coarse particles takes place just the same unless the pulp is thick enough. The ordinary Wheeler pan can be arranged to take the pulp from near the center by running a pipe through the drain exit at the bottom of the pan to a point near the spider.[1] M. W. von Bernewitz says from 1½ to 4 parts of water to one of ore may be used. I have found for a particular ore, 2½ parts of water to one of ore to be about right. Mr. von Bernewitz says: "The pan is an excellent machine and I would certainly advise its installation in a small mill where the expense of a tube mill is not justified." This is also my own opinion. Each 5-ft. pan requires about 7 hp. and costs, set up ready to run, about $800.

Pans Installed as Fine Grinders

I had an occasion for such an installation in a case where sufficient funds to buy a tube mill were lacking, and while the results obtained with the pan were satisfactory for the purpose intended, amalgamating and fine grinding, the two functions combined do not produce ideal grinding work. For amalgamating, the pan speed must be kept as low as 30 r.p.m.; for grinding alone, about 45 r.p.m. The pulp for amalgamating is also kept more dilute than is required for proper grinding.

In a small plant the cost of running pans is nothing for labor; and for repairs, only inexpensive cast iron. The iron used in some Homestake pans is given at 4.23 lb. per ton of ore ground, and in those of the Vulture mill, Arizona, at one pound per ton. My own experience shows about two pounds per ton. This is the only expense to the pans, and while its costs are lower than with tube mills when making 10- to 150-mesh product, the reduction to a 200-mesh or finer product is more difficult to obtain.

The pulp going to pans should be classified so that the pans do no useless work on ore already ground sufficiently fine. We then must consider classifying, dewatering and thickening devices and while every engineer would recommend such standard machines as Dorr classifiers and thickeners, Pachuca tanks and Moore filters, the small operator must be content with some form of continuous or intermittent decantation eliminating all complication in machinery. When planning the small plant, provision should be made for the installation of these



Air-Agitation Tank

standard machines at some future time, a classifier before the pans, the replacement of pans by tube mills, a thickener before the agitating tanks and a dewaterer before the filter. In the present case we are compelled to use hydraulic cones for classifying and thickening, and choose the Callow cone as answering the purpose, a 6-ft. cone for 10 stamps and a 4-ft. one for five stamps, as classifiers, and an 8-ft. cone for thickening in each case.

Simple Agitating Device

We now come to agitation, and for this purpose I chose a continuous-decantation system with the pulp flowing in the opposite direction to the solution. The tank I designed, four of which were installed, combines agitation with decantation. This is the type of tank designed by Spaulding, except that he decants from a central suspended pipe, while I decant from an annular space at the periphery. This idea has been used to a limited extent by other operators, but I make it the sole method of decant-

[1]See paper on "Economical Fine Grinding in Pans," "Eng. and Min. Journ.," Sept. 27, 1913.—Editor.

ing clear liquid. The details of the tank are shown in the illustration where *A* is the central agitating column which, as well as the air jet, may be provided with means of lowering or raising to suit conditions. *B* is the annular settling space, 15 in. wide and 12 ft. deep, where no agitation takes place. In the bank of four tanks used, the last being a decanting tank, the air jet and central lift pipe are placed somewhat above the bottom.

In my preliminary tests I used a tank 8 ft. in diameter and 8 ft. deep with the annular settling space 1 ft. wide and 6 ft. deep, and obtained clear solution from the overflow and had an extraction of about 84% with 12-hr. agitation. This extraction could have been increased by finer grinding but not by longer agitation. This tank was flat bottomed with four air jets in 4-in. pipe casing extending to within a foot of the top of the tank and to within 6 in. of the bottom. In designing the final tanks, it was thought better to have the tanks higher and equipped with conical bottoms and one central jet. The cost of four of these tanks 18 ft. high and 10 ft. diameter, with all piping, will be about $1500. If a centrifugal pump be used for agitating, the pulp may be delivered below the surface and in such a way that the mass has a circular motion in the tanks.

The system of milling devised began with a rockbreaker and was followed by stamps with narrow discharge mortars, classifying in cone, regrinding in pans, overflow from cone to a Callow tank, used as a dewaterer, thickened pulp from pans to agitator with the underflow from dewaterer, overflow from dewaterer to gold-solution tank together with an overflow from decanter-agitator tank and discharge of impoverished pulp from fourth tank. The second, third and fourth tanks were used for washing with barren solution. The efficacy of this system depends upon the rate at which a particular pulp will settle. In the example in question, the ore did not readily slime to a colloid state and the sand, even as fine as 200 mesh, settled with ease so that the annular space left for settling was more than sufficient. The amount of solution drawn off, and, consequently, the amount of gold solution taken from the pulp in its several washings, depends entirely upon the rate of settling, but with this possible exception on some ores, I believe this style of tank may be used to advantage in many cases where the cost of a filter installation is so high as to be out of the question.

Grindstone Manufacture

The Berea grit of northern Ohio is a stone of considerable economic importance. One of the important products of the quarries is grindstones. Their manufacture is described by Wilbur Greeley Burroughs (*Econ. Geol.*, August, 1913). All sizes are turned, ranging up to 7 ft. in diameter, with a thickness of 14 in. The blocks of stone, as taken from the quarry, are sawed to nearly the desired thickness; then cut by hand to a roughly circular shape. A small hole is cut in the center with a pick. The lathe is passed through this hole and the stone firmly clamped. As the stone revolves rapidly in the lathe, the workman holds the end of an iron bar, called a "turning iron" against the sides, which are thus smoothed, the stones being cut to exactly the desired width. The stone is made circular by cutting a groove a little way back from the edge. When this is cut to a moderate depth, the lathe is stopped and the rim of stone knocked off with a hammer. If the groove is too deep, the rim may fly off with dangerous velocity. The rough edge which is left is smoothed by once more revolving the stone with the turning bar against the edge. The rough surface, where the stone was clamped to the lathe, is smoothed by hand after the stone is otherwise finished.

Chenhall's Tin-Extraction Process

A short description of Chenhall's tin-extraction process will be found in the JOURNAL of Apr. 26, 1913, p. 855. A longer report on it from the *Mining Journal*, Sept. 26, 1913, is printed below.

The Chenhall process is a chemical one, by which the metals contained in the ore are made soluble in acid solutions, and recovered therefrom by means of precipitation.

The ore is first crushed, then mixed with fine coal dust or other carbonaceous material, and heated in a closed furnace until the oxides of the metal are decomposed, leaving the metals distributed throughout the roasted ore in the form of fine metallic grains, care being taken to prevent reoxidation of the metal, or metals, during cooling.

The gas disengaged during the roasting is collected and stored, and when the flow of gas from the mixture of coal and ore almost ceases, that which has been stored is returned to the furnace, so that during the whole of the time the ore is in the furnace it is in an atmosphere of coal gas. The coal mixed with the ore, being converted into coke, keeps the ore open, and allows the gas in the furnace to permeate the whole of the ore, as well as to act as a deoxidizing agent.

The cool roasted ore is afterward submitted to treatment with acid solutions. When tin is the predominant metal, the first solution consists of sulphuric acid and water, and should there not be sufficient iron in the ore to produce iron sulphate, a little iron is added; about 85% of the tin contained in the ore is dissolved out by means of this solution. The ore is now washed with water, and the final solution (hydrochloric acid and water) is added, by which the remaining tin is dissolved out. When any copper is present in the solution, which is always the case when it is present in the ore, it is precipitated from the solutions by means of metallic iron (wrought scrap). Any insoluble material in the liquor is allowed to settle, and the clear liquors treated with sulphureted hydrogen, which at once precipitates the tin in the solutions in the form of sulphide, which is collected, dried and heated, slowly at first and then to a dull-red heat, which converts the sulphide into oxide of tin, and the sulphurous acid conducted to chambers for the production of sulphuric acid.

The waste liquors, after the tin has been extracted, are evaporated. The first solution for the manufacture of sulphate of iron, and the second chloride solution for the manufacture of red oxide of iron (rouge), by this means the excess of acid necessary through the presence of iron in the ores is converted into a salable product, thus recovering the value of the acid so used as a valuable by-product.

The acid solutions are continually passed over fresh lots of roasted ore until practically all the acid is combined with the metals, and the ores receive a sufficient number of fresh acid solutions on them so that the whole of

the soluble metals are dissolved out. The amount of acid consumed depends on the character of the ore to be treated, ores from different mines varying in the amount of soluble materials they contain.

When there is sulphur or arsenic, unless present in small quantities, it becomes necessary to give the ore a preliminary roast, when the arsenic is recovered in the form of white arsenic (arsenious acid), and the sulphur, when the sulphur is high enough to give a sulphurous-acid gas of from 2½ to 5%, is made use of for the manufacture of sulphuric acid, which is largely used for the extraction of the tin contents of the ore.

Tungstic acid, when in the ore, remains in the residue, and is extracted by means of an alkaline solvent, and recovered from the solution as very pure tungstic acid. The loss of tungstic acid with the present methods of recovery of the wolfram in tin ores is 75% of the wolfram in the ore.

The plant needed for this process is that required for the manufacture of the two acids (sulphuric and hydrochloric); suitable closed furnaces in which during the roasting of the ores and their cooling, the air is excluded, and the presence of carburetted-hydrogen gas is maintained during the roast; the means for effectively leaching the roasted ores, precipitating the tin, and the recovery of the byproducts, including the acid used, when not sold in the form of byproducts.

The cost of the process will vary with the metallic contents of the ore, and the amount of byproducts there is to recover from the ore. The roasting will cost from 4s. 6d. to 5s. 6d. per ton, and the leaching a further 1s. 6d. to 2s. per ton. The cost of the production of the necessary acid (sulphuric) will be, say 45s. to 50s. per ton, and the (hydrochloric) about 80s. to 85s. per ton. A large percentage of the acid used will be recovered for further use in the process.

Mr. Chenhall has treated successfully ores from the Dolcoath, Carn Brea & Tincroft, East Pool & Agar, South Crofty and other mines, also residues from the Red River and the Fal River, and other waste heaps.

Johannesburg Notes

The shortage of natives still continues, the deficit for August being 12,000. The Jupiter mine has suspended crushing, all the natives having been transferred to the Knights Deep mine, to enable that company to make profits. The Cinderella Consolidated has stopped sinking its eastern shaft, thus postponing the time of resumption of crushing and hanging up the scheme of development. Men are everywhere being dismissed, and among them some leading unionists. This has led to charges of victimization and some of the leaders have been threatening another strike, but of that there is no chance. Some of the leaders are being tried for seditious speeches made since the strike and the government has now a firm grip of the situation. Meanwhile, it is preparing to give legal effect to several of the just demands of the men, which have been granted, and the 8½ hours bank to bank is now being enforced.

The mining industry has invited Colonel Gorgas from the Panama Canal to visit the Rand and advise regarding health conditions. The Modderfontein Deep has secured capital to place the mine on a producing basis. The Modderfontein Deep has secured capital to place the mine on a producing basis. The worst feature of the outlook for the future of the Rand, is that when the State Mines shaft strikes the reef, there will be only one shaft (at Daggafontein) on the whole Rand being sunk to develop new ground. There should be six or eight started on the East Rand at once. The Chamber of Mines has arranged with Rhodesia to take the tropical natives who were debarred from coming to the Rand, and will receive in exchange certain natives who are now recruited for Rhodesia in territory the Rand can draw from.

Mineral Production of Oregon in 1912

The value of the production of gold, silver, copper and lead, in Oregon, in 1912, according to Charles G. Yale, of the U. S. Geological Survey, was $849,886, against $669,016 in 1911. The total yield of gold was $770,041, an increase of $136,634 over the 1911 production. Of the gold output, $580,945 came from placers. There was an increase in production from hydraulic mining of $38,131, but there was a small decrease in the yield from drift and surface mines. About 50% of the placer gold recovered came from the mines in Josephine and Jackson Counties. The gold recovered from deep mines amounted to 28,103 fine ounces, valued at $580,945, of which 27,278 oz. were derived from siliceous ores, 616 oz. from copper ore, and 209 oz. from lead ores.

The southwestern counties of Oregon, Coos, Curry, Douglas, Jackson, Josephine and Lane, which form an extension of the California gold belt, made a combined production of $217,565 in gold, and of $10,343 in silver. Northeastern Oregon, comprising Baker, Crook, Grant, Malheur and Wheeler Counties, reported a gold production of $552,476, of which Baker County contributed $484,041, or 87.6%. The silver production of Oregon was 57,081 fine oz., valued at $35,105, compared with 45,221 oz., valued at $23,967, in 1911. Of the 1912 production, 1941 oz. came from placers, 44,018 oz. from siliceous ores, 10,555 oz. from copper ores, and 567 oz. from lead ores.

The copper production increased in Oregon from 93,136 lb., valued at $11,642, in 1911, to 260,429 lb., valued at $42,971 in 1912. All the copper except 6049 lb. was derived from ores mined in Josephine County. The production of lead in Oregon in 1912 was 39,317 lb., valued at $1769. The output came from a small quantity of lead ore mined in Jackson County and from concentrates shipped from Lane County.

There were 210 producers of gold, silver, copper or lead in 1912, compared with 176 in 1911. Of the 210 producers, 54 were deep mines and 156 were placers. Of the placers, 102 were hydraulic mines, eight drift mines, and 46 surface or sluicing mines. There was no recovery of gold by dredging reported in 1912. The total quantity of ore sold or treated in 1912 amounted to 90,945 tons, which was 7613 tons less than in 1911. The average recovery from siliceous ores in gold and silver increased from $5.03 in 1911 to $6.84 in 1912. The recovery of gold and silver from copper ores increased from $3.32 to $4.21 per ton. Though the ore sold or treated in 1912 was less than in 1911, the value of the gold recovered from deep mines was $115,813 greater than in 1911, and the average recovery in gold and silver from all classes of ore increased from $4.96 a ton in 1911 to $6.76 per ton the year following.

Righting an Overturned Gold Dredge

By Lewis H. Eddy*

SYNOPSIS—Natomas No. 5 dredge was sunk starboard side down in 49 ft. of water, June 8, 1913, a hole having been punched in the starboard side. The water was immediately pumped out of the pond, the dredge righted without further damage than was caused by sinking, and was ready for repair on July 15, 1913.

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Dredge No. 5, owned and operated by the Natomas Consolidated, of California, in the Natomas field of the American River district, was built by the Western Engineering & Construction Co., for the Folsom Development Co. It was equipped with seventy-nine 9-cu.ft. Bucyrus buckets and Bucyrus machinery, and was placed in commission at Rebel Hill, in December, 1905. It was taken over by the Natomas Consolidated in 1909. Seven and one-half years is a good record for a wooden-hull dredge. The fact that the wooden parts and the machinery withstood the strain of sinking and righting, leaving the boat in good condition for repair, attests the quality of the material used, excellence of machinery and the accuracy of design and construction.

Fig. 1. Cables Attached, Sand Bed Prepared, Taking Initial Pull, and Testing Cable

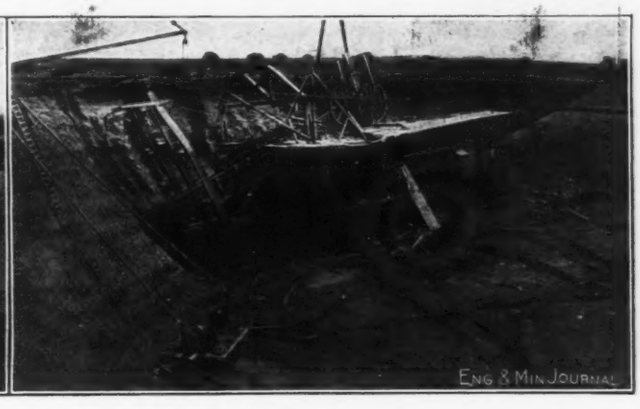

Fig. 2. After Being Righted, Water Pumped Out of Pond Ready for Final Inspection

Loosened Bolt Cause of Sinking

The hole which caused the sinking of the dredge was punched 11 sets forward from the stern. It was 16 in. long and 8 in. wide, and resulted from a loosened bolt in rotten wood. The boat began to list immediately after the water started to flow through the hole, and an effort was made to stop the leak from the inside. When this was found impossible, owing to the amount of water flowing in, a piece of canvas to which iron bars were attached was let down on the outside to cover the hole sufficiently to lessen the volume of water flowing in and to enable the men to work inside. The pressure was too great for the canvas and the water continued to pour in through the hole. M. E. Tong, dredgemaster, made a second visit inside and tried to shift the canvas toward the stern in order to entirely cover the hole. The boat continued to settle and Tong had been in the hold only four or five minutes when the water began pouring in through the hatchway, and it was only because of the assistance of the winchman and oiler that he was able to drag himself against the stream and through the hatchway to the deck. The three men had remained on the boat 10 min. after the leak was discovered. They cut out the electric switches and jumped off the gangplank to the shore as the dredge turned over starboard side down and began to settle rapidly to the bottom of the pond.

The dredge sank on Sunday, at 10:45 a.m., and on Monday preparations were made for pumping out the pond. The initial pumping was done with a two-step, 5-in. pump. When the water had been lowered as low as this pump could reach, two single-stage pumps were placed on a barge floated in the pond. As the barge settled with the lowering of the water, the pipe was lengthened until the pond was cleared. As soon as the water was out of the pond a general inspection of the dredge was made. The revolving screen was slightly twisted and some of the smaller machinery parts were broken. The general appearance of the hull was favorable to righting the boat, but some doubt was entertained as to the condition of the timbers, until close inspection had been made. As the dredge was an old one, there was some doubt expressed as to whether or not it could be righted without going to pieces or being badly racked.

The position of the dredge, lying flat on the starboard side, made the inspection, partial dismantling and preparation for righting feasible and convenient. The hull dimensions are 135x48x10 ft.; displacement about 1000 tons. The empty pond was about 200 ft. wide and 200 ft. long, from the face of the cut to the tailing piles, and 60 ft. deep. The dredge had been digging 49 ft. below the water line against an 11-ft. bank.

The outer walls were badly rotted. There were many rotted boards in other parts of the hull, but comparatively few rotted timbers, and none badly rotted in the bottom. The timbers and boards that were badly rotted were on the outside or in position of exposure to the beating or dripping of water. The former practice in dredge building of boring holes in timbers and running rods through them was responsible for some of the timber rotting. This practice has since been abandoned and yokes extending around the timbers are now used for holding the rods.

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Summer- and Winter-Built Dredges, Weather- and Kiln-Seasoned Timber

Comparison of No. 5 with No. 6 dredge in the same field is interesting, and the disclosed facts, which have not been published, should be of value to builders of wooden dredges. No. 6 was drydocked in May, 1913, and required a new hull besides other repairs.[1] This boat was in service five years and three months, No. 5 had been in service seven years and six months, and was in much better condition after sinking than No. 6 at the time of drydocking. Both dredges were built under the supervision of R. G. Hanford, and the timbers and lumber for both were selected by D. P. Cameron. Both men are experts. No. 5 dredge was built in the summer, of weather-seasoned wood. No. 6 dredge was built in the winter, of kiln-seasoned wood. Careful observation and close record in the American River, Yuba Basin and Feather River districts by the W. P. Hammon interests, during the general management of Newton Cleaveland, disclosed these facts. That wooden dredges built in the summer have outlasted those built in the winter; and that weather-seasoned timber and lumber used in dredge construction have longer life than timber and lumber that is kiln-seasoned.

Fig. 3. Top View, Showing Parts after Top Housing and Pilot House Had Been Removed. Water Beginning to Fill Pond

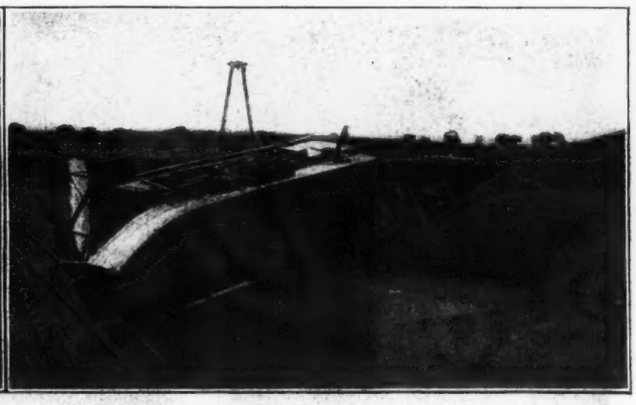

Fig. 4. Bottom and Port Side of Dredge. A Pull Is Being Taken While Water Is Running into the Pond

When No. 5 dredge sank, the bucket line went clear of the digging ladder at the lower tumbler, leaving the ladder in position to be easily cut in two. The bucket line was first broken by blasting in three places, and half the line was taken out. The bucket pins were removed and the buckets lifted out singly with a derrick installed at the edge of the pond. The lower tumbler was also hoisted out with the derrick. When the lower end of the ladder was clear the point was burned off at the first butt in the side plates and hoisted out with the derrick. The upper end of the ladder, with the remaining buckets in line, was hauled up with the derrick to the deck line and within the well hole between the timbers of the bow gantry, where it remained while the boat was being righted.

The derrick is of 15-tons capacity; the mast is 90 ft. high, the boom 90 ft. long. The foundation sills of the derrick rested on the cemented gravel on the edge of the shore, flush with the pond, and were set 4 ft. below the shore surface in a cut made for the purpose. The solidity of the cemented gravel which the dredge had been digging was well shown by the placing of the derrick in this position.

The two spuds, having a total weight of 116,000 lb., were hauled out of their casing with a six-part tackle from a 38-ft. A-frame and left leaning against the bank. When the boat went down the stacker struck the bank, broke loose from the dredge and dumped over the motor. When the pond was pumped down the stacker was removed to the shore in the same way as the spuds. The hauling power in both cases was a tractor engine. The stacker frame was a lattice-girder type, 138 ft. long, weighing 39,280 lb., and provided with a 36-in. conveyor belt 280 ft. long. All the housing on the upper deck was removed. Several loosened parts of machinery and some smaller parts that were broken were removed and a portion of the wire screen around the gold-saving tables was cut out so as to make access easy to various parts of the boat.

While the lines were being rigged for pulling the boat over to rest on the keel, a foundation or bed was constructed of tailings sand, which, during the operation of the dredge had been deposited apart from the heavy gravel. This sand carries a large amount of cementing material, and when leveled and tamped becomes hard and solid. This property made it an ideal material with which to make a bed for the righted dredge to rest upon.

A sling of 2-in. cable was placed around the upper tumbler and brought out and up over the boat to the side of the deck and attached to a sheave. A 1½-in. cable was run through the sheave and out to the shore. A winch was placed on the shore about 50 ft. off the bank of the pond opposite the forward end of the boat. A 1½-in. cable was connected to the winch, and on July 3 a pull was taken with a view to easing up the forward end of the boat and testing the strength of the timbers and the general structure to decide whether or not the structure would hold together in withstanding the strain of a pull equal to lifting 200 to 300 tons. The sheave placed on the top of the boat through which this cable was run was a cast-iron sheave and did not hold. The improper placing of a clip on the shore end of the cable, where it was connected with the shore sheave, caused the cable to break during the first hard strain after the cable had been tightened.

[1] "Eng. and Min. Journ.," Aug. 23, 1913, p. 340.

Rigging for Righting Dredge with Winch

Three hitches were then made ready before turning water into the pond. Four parts of 1½-in. plough-steel line were passed around the upper tumbler shaft and up over the tumbler and bucket line, through the spokes of the gear, through the upper deck, to a point at the edge of the lower deck about amidships. These parts were attached to a 2½-in. wire-center bridge cable (256 tons) by a double deadeye in a rope socket (open) with a 4½-in. pin. At the shore end of the cable, 300 ft. long, a heave shore sheave was engaged, through which was passed a 2-in. plow-steel line, 144 tons, one end of which was made fast to a deadman, 24x28 in., by 20 ft. long, which was anchored on a rock pile and covered about 12 ft. deep. The other end of the 2-in. line was made fast to the headblock of a six-part tackle, 1⅛-in. line, with about 100 ft. drift. On the fall of this tackle a jig tackle of four parts of ¾-in. line was rigged with about 125 ft. drift, the fall of which ran to an A., H. & D. Co. winch, with a pull of about five tons. The jig tackle was fleeted four times. The pennants slacked quite perceptibly when the hull was at about 45°. Although this hitch showed severe strain, nothing parted or gave way. The probable load was 200 tons.

A second hitch was made by passing a 2½-in. center-wire bridge cable over the other strap on the upper tumbler, down through the decks on the lower side to the main keelson, which supports the batter post of the athwartship truss at the main gantry. This line was passed once around the keelson and fastened with five 2½-in. Crosby clips. To the other end of this pennant, 300 ft. long, was attached a shore sheave through which passed a 1½-in. plow-steel line, one part of which passed through a sheave on shore and returned to a becket on the first sheave. The other end of this line was attached to the headblock of a six-part tackle, on the fall of which was placed a four-part jig tackle the same as the one previously described. On the fall of the jig tackle was hooked a 9-ton Holt gas tractor. The tractor was too fast for the winch and parted four of the seven strands of the 2½-in. pennant about midway. To the end on board, a 2-in. bridge cable was clipped with eight 2½-in. Crosby clips. In the open rope socket in this line was then engaged the headblock of a four-part, 1¼-in. tackle, single sheave ashore, and the dead end was fastened to a deadman. A four-part jig tackle was rigged to the fall, the fall of which was led to the tractor. This gave about 100 tons pull before slipping the clips. This hitch was not a right-angle pull, but led forward at about 60° from fore-and-aft center line.

A third hitch was rigged from the stern by passing a 2-in. plow-steel line around on the starboard spud casing, blocking it well between the line and the casing, and passing under the line. This was clipped back upon itself with three Crosby clips. The other end of this line was passed over the main trusses at the rear of the revolving screen and down through the main deck to the keelson supporting the after screen-support. In the bight of this line, which was about 200 ft. long, was hung a heavy short sheave, around which was passed a 1½-in. plow-steel line with dead end ashore and to the other end of which a six-part tackle was attached. On the fall of this tackle a three-part jig tackle was placed, the fall of which led to the winch previously described. This hitch was not at a right angle to the center line, but led forward at about 60°. The breaking strength of this haul was about 180 tons and about 100 tons strain was kept on it till the hull passed the 45° angle, when all the hauls slacked perceptibly for a short distance. All the tackles were then fleeted and the hauling continued until the hull was nearly level athwartship. A four-part tackle was then rigged on the bow-gantry cap and the trusses were pulled into alignment before pumping down the water that had been turned into the pond to lighten the strain of the hauls. The final hauls settled the hull in the mud and sand in a very easy position, about six feet lower at the bow than at the stern, and entirely accessible on all sides for necessary repair.

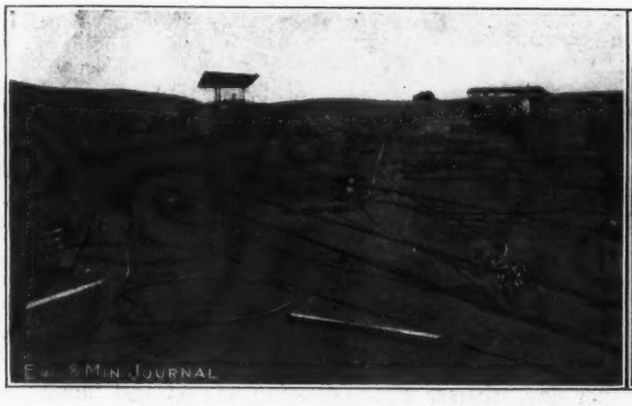

Fig. 5. Cable Rigging, Winches and Traction Engine Used to Right Dredge

Fig. 6. A-Frame and Derrick, Rigging Ready for Pulling Dredge Over

It was expected that the boat might settle rapidly after passing the 45° angle and the hull would strike hard on the bottom of the pond, causing a jarring of the machinery and twisting of the wooden parts. On the contrary, a continuous strain on the cables was necessary after one slackening of the hauls until the hull settled. The ease with which the boat settled was due to the fact that the starboard wall of the hull had been buried in mud, and the water turned into the pond did not wash the starboard side of the hull clear, but merely loosened the mud and at the same time loosening the sand bed on which the hull finally rested, so that the starboard side of the hull had to be pulled out of the mud, and the hull settled gradually on the bottom of the pond.

The entire work was done in 36 days, and six days of the time were occupied in pumping the pond dry. This is record time for this character of work, and is exceptionally good time considering the caution necessary to prevent racking. All the work was done by the Natomas Consolidated under the supervision of L. D. Hopfield, general superintendent, and the direct superintendency of T. C. Parker.

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The Production and Consumption of Chemical Fertilizers in the World

A publication of the Bureau of Agricultural Intelligence and Plant Diseases of the International Institute of Agriculture (Rome) has recently been issued, entitled *"Production et consommation des engrais chimiques dans le mode."* This has been summarized in the *Journal* of the Society of Chemical Industry.

PRODUCTION IN METRIC TONS

	1903	1910	1911
Phosphatic fertilizers:			
Mineral phosphates	2,433,779	5,344,981	6,055,073
Basic slag	2,243,500	3,275,845	(3,485,500)
Superphosphates	5,130,900	9,604,260	.....
Guano	(56,000)	(66,044)	.....
Potash salts (for agriculture):			
Potash salts (calculated as pure potash)	301,144	766,583	840,000
Indian salpeter	20,370	15,581	15,273
Other potash fertilizers (calculated as pure potash)	.....	.....	40,000
Nitrogenous fertilizers:			
Nitrate of soda	1,466,993	2,432,949	2,487,000
Sulphate of ammonia	537,520	1,045,905	1,187,425
Cyanamide	.....	30,000	52,000
Nitrate of lime	25	25,000	50,000
Total nitrogenous fertilizers	2,004,538	3,533,844	3,786,425

It is believed that 1,000,000 metric tons of chloride of potash, corresponding to 630,000 metric tons of pure potash, could be produced yearly in the United States from seaweeds. It has also been proposed in the United States to use feldspars for the extraction of potash in a soluble form; a yield of 400,000 metric tons of pure potash could thus be obtained yearly. The production of sulphate of ammonia has increased fivefold in 20 years. The Mond-Frank-Caro process would allow of the manufacture of 88 to 176 lb. of sulphate of ammonia per metric ton of peat. The production and probable consumption of synthetic nitrogenous fertilizers has been calculated for the years 1913 and 1914. The figures which have been estimated are inclosed in brackets:

	Calcium cyanamide metric tons	Nitrate of lime metric tons
1903	.....	25
1904	.....	550
1905	.....	1,600
1906	500	1,600
1907	2,200	15,000
1908	8,300	15,000
1909	16,000	25,000
1910	30,000	25,000
1911	52,000	(50,000)
1912	95,000	(75,000)
1913	(97,000)	(140,000)
1914	(208,000)	.....

The world's consumption of fertilizers in 1911 represented a value of about £80,000,000, and was made up as follows:

	Metric tons
Lime phosphates	5,669,000
Superphosphates	8,604,000
Basic slag	3,500,000
Guano	70,000
Potash salts	4,100,000
(Pure potash)	(848,400)
Nitrate of soda	2,313,450
Sulphate of ammonia	1,100,000
Synthetic nitrogenous fertilizers	100,000

Data are given on the consumption of fertilizers per unit of area in the different countries. Belgium, Mauritius and Luxemburg use upward of 278 lb. per acre of cultivated area; Germany and the Netherlands from 89 to 178 lb. per acre; Denmark, United States (Southern States), France, England, Australia, Italy and Switzerland from 45 to 89 lb. per acre; next follow the countries consuming from 9 to 45 lb. per acre of cultivated land: Austria, Hungary, Spain, United States (North-East), Norway, Dutch East Indies, Portugal, Sweden. All the remaining countries consume less than 9 lb. per acre or an unknown amount.

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Sulphuric Acid Manufacture in Great Britain

According to the report of the British Alkali Inspector for 1912, operations at sulphuric acid works were carried on actively for the greater part of the year and were less interfered with than some others by the coal strike. A slow but steady reduction in the number of works is recorded, but an increased aggregate production, the works closed being generally of small capacity. The different forms of mechanical burner, as also fans, came into more extended operation during the year, and there is a general tendency to appreciate the advantage of increased Gay-Lussac tower space. In the Widnes district large fans, running at low speed, are said to be more in favor, and are generally placed between two Gay-Lussac towers.

As a striking instance of the advantage of reduced chamber space, mention is made of a works where two chamber sets were formerly worked without towers, the chamber space of 24-25 cu.ft. per lb. of sulphur charged per day, whereas after denuding one set and increasing the height of the first and second chambers of the other (3-chamber) set from 18 to 25 ft., introducing towers of liberal size, fan draft, and water spray in lieu of steam, 28% more acid was produced with 67.7% of the original chamber space and 11.4 cu.ft. of space per lb. of sulphur charged per 24 hours.

A novel method of introducing nitrous gases by spraying niter solution into the first chamber is reported to have given satisfactory results at another works and appears likely to extend. The "Opl" system referred to in the last report (ENG. AND MIN. JOURN., Feb. 13, 1913, p. 378) has continued in constant use, and a second installation has been put into successful operation. A fatality caused by the inhalation of nitrous vapors is recorded; this occurred during the removal of coke packing from a Gay-Lussac tower, although previously well washed out. Means recommended for reducing to a minimum the dangers associated with the operation in question are: (1) washing the tower with strong sulphuric acid prior to washing with water and steam, (2) the maintenance of a downward draft, and (3) the use of a "safety pipe," fitting with a pneumatic pad against the face of the operator, as required by the special rules of the United Alkali Co. The use of fans in place of the steam jet form of draft inducer in Kessler plants for concentrating sulphuric acid is on the increase. The "cascade" system of concentrating continues to gain in favor and is now in widely extended operation, silica and "tantiron" evaporating vessels being used.

Dust in Johannesburg Mines

The Miners' Phthisis Prevention Committee has issued another interim report to the minister of mines. It notes that the dust found in the lungs of victims of silicosis is exceedingly small in size, the great bulk being only 0.001 mm. in diameter, with odd grains up to 0.01 mm. An apparatus consisting of an exhausting apparatus, a fine screen to arrest dust larger than 0.06 mm. and a filter of moist sugar was devised for estimating the finer dust underground. Earlier determinations of fine and coarser dust in underground air drilling without water in 1903 showed 307 mg. per cu.m.; in 1910, 170 mg. Cornish mines showed 460 mg. In Jumpers Deep mine, in 1912, dry drilling showed 59 mg. of fine dust; when drilling wet, with sides of drive wet, the amount was 13 mg., and in the City Deep mine, only 4 to 8 mg. The committee is satisfied that dust-catching arrangements are of little use; but that dust formation must be prevented by the use of water in drilling all holes.

Regarding dust from blasting without water blasts or sprays, a sample 200 ft. from face of drive showed 151 mg., with two sprays installed, 91 mg. One hour after blasting, only 8 mg. remained and two hours after, only 2 mg. Where a water blast was used, 30 min. after blasting showed 12 mg. and one hour 6 mg. In slopes, while wet holes were being drilled and shoveling was proceeding, 4 to 6 mg. were present. Shoveling dry rock showed the presence of 18 mg., and when the rock was wet, only 2 mg. The dust in the air of the Aurora West mine showed itself most difficult of settlement after blasting by sprays and water blasts. The amount in the return airway from several stopes 21 min. after blasting was 286 mg.; devices reduced this to 80 mg. I understand, however, that there is some peculiarity in the dust from this mine, as the dust from other mines was settled much more readily. In the Village Deep mine the amount of dust in the air passing the exhaust fan was at 2 p.m., 3.5 mg.; 2:40 p.m., 1 mg.; 3:15 p.m., 9.0 mg. (blasting time 3 to 4 p.m.); 4:40 p.m., 12.5 mg.; 5.45 p.m., 9.0 mg.; 6:40 p.m., 5.5 mg.; 8:45 p.m., 3.0 mg. Experiments with upcast air in the Simmer Deep mines showed a large diminution of dust, owing to the use of water underground.

DUST TESTS IN SIMMER DEEP UPCAST

Time	Sept. 1911 No Sprays Used	April 1912 Sprays and Wetting	Sept. 1912 Sprays and Wetting
9.10 a.m.	280 mg. per cm.	32.0 mg.	3.3 mg.
11.30–12.30	130	21.0	0.2
2–3 p.m.	80	39.0	2.1
4.15–5.15	100	14.0	17.1

Except immediately after blasting at the City Deep, the average was 1.6 mg., Brakpan min 1.5 mg. The dust in Johannesburg streets was 2 to 16.5 mg. in April and May and in Paris 7.5 to 23 mg.

Respirators were found inefficient in catching dust when amounts of 50 mg. or over were present. The dust is fine and sharply angular in character, 10% being over 0.007 mm. in diameter and the remainder 0.003 to 0.001 mg. Analysis and examination tends to show that the dust resisting settlement by sprays probably contains a large proportion of talcose or argillaceous (greasy) material which will not moisten. This dust should be less harmful than the silica dust. Most of the dust found in lumps appears to be from blasting and some resembles that from drilling. Dump dust and dust from streets are not found; 15% of the samples examined, collected underground, especially on ladderways, showed presence of tubercular germs. Experiments and tests underground generally showed a vast improvement of recent years, and if the miners could only be induced to do their share, phthisis might be eradicated.

Developments on the Michigan Iron Ranges

MARQUETTE CORRESPONDENCE

The Judson Mining Co., in which E. J. Longyear, of Minneapolis, and Joseph Sellwood, of Duluth, are interested, is sinking a shaft on its property in the Mastodon field on the Menominee range, where have been made the most notable of the recent discoveries of iron ore in the Michigan ranges. Mine buildings and a group of dwelling houses are being built at Alpha, a town now but in its infancy. A second shaft is contemplated, and shipments will begin next year, as the overburden is but 100 ft. deep and ore will be encountered soon after it is penetrated.

Extensive drilling operations are under way on the Mastodon field as well as considerable work preliminary to the opening of mines. North of the Judson and between it and the town of Alpha, Pickands, Mather & Co., of Cleveland, are commencing the development of the Balkan tract, a property that has been determined by drilling to be of great value. It is planned to work the mine as an openpit, despite the fact that there is considerable overburden; the shaft now being sunk is for drainage. North of Alpha, the Cleveland Cliffs Iron Co. and the U. S. Steel Corporation control extensive tracts that are being explored. A number of smaller companies are drilling in the surrounding territory.

Alpha promises to be a good-sized town. The employees of the Judson and the Balkan companies will live there, as well as the men employed at other mines that will doubtless be opened. Much of the district lies in a well defined mineral belt and important developments are expected within the next few years. It is planned to build Alpha on an adequate scale. As the town is laid out at present there are 256 lots. A $30,000 school building and sewerage and conduit systems are contemplated.

The U. S. Steel Corporation has been employing two steam shovels in loading ore from the stockpiles at the Chapin mine at Iron Mountain, on the Menominee range, the product going to the docks at Escanaba over the St. Paul R.R. The daily shipments, including the amount hoisted from the shafts, has ranged between 100 and 135 carloads. On the Marquette range, the Cleveland-Cliffs Co. has a steam shovel at work at the stockpile at the Imperial mine at Michigamme.

The mining properties in the Baraga County division of the Marquette range include the Ohio, Portland, Imperial, Webster, Beaufort, Titan and Catherine, west of Michigamme, and a graphite mine near L'Anse. Although many millions of tons of ore have been proved up, but little work is now being done. The ore is of a quality that cannot be generally used to advantage and there is no particular demand for it at present. The formation extends for several miles. The ore lies close to the surface in the greater part of the zone. Should the time ever come when the demand for limonite ore is heavy, the district can furnish an enormous tonnage. Several of the mines are equipped to produce heavily. The Rogers-Brown Ore Co. has completed the installation of

an ore crusher and an aërial tramway connecting the Ohio and Portland properties. With the exception of this improvement work the two mines are idle, as are all the others in the field, excepting the ore loading in progress at the Imperial.

The Lake Superior Iron & Chemical Co., operating charcoal-iron furnaces and chemical works at several places in Michigan and at Ashland, Wis., has for several months been experimenting with a new byproduct and has about perfected its manufacture. The commodity is a wood preservative and is manufactured from material that now goes to waste at the various plants. A carload of this new product was shipped from the Manistique works recently and as soon as a market can be created apparatus will be installed in all plants for its manufacture. The works at Newberry, Mich., will have a daily capacity of about 700 gal., and the Manistique plant a capacity of 300 gallons.

M. A. Hanna & Co., of Cleveland, is opening a mine on the Gogebic iron range. The property is the Wakefield, south of the village of Wakefield, Mich. The ore was discovered by Seldon Rose, of Marquette. The deposit lies so close to the surface that it is the intention to strip the overburden and mine the ore with steam shovels. Rose, who is a mining engineer and geologist, was attracted by the rock formations of the vicinity and he decided to do exploratory work. He procured a lease to the tract from the Keweenaw Association, of Boston, the owner of the fee. A churn drill was used and ore was encountered from 30 to 70 ft. from the surface. The deposit has been proved to be of large proportions. The ore is of the highest grade. Since this discovery several drills have been put into commission to the east and the west by other men. This ore is found considerably farther south than any heretofore located in the Wakefield district, with indications the deposits will prove more extensive than those of the ore measure to the northward.

The Breitung interests of Marquette, operating on the Marquette range, will this season make the heaviest shipments in their history. It is expected that 600,000 tons of ore will be sent down the lakes. Of this, 400,000 tons will be forwarded from the Mary Charlotte and 100,000 from the Breitung Hematite, both at Negaunee, and 100,000 from the Baron mine at Humboldt. The mines are being worked with large forces, though these are not the largest employed at any time since the properties were opened. Much of the shipments to date have been from the stockpile and have represented last winter's output. There are still 150,000 tons in stock at the Mary Charlotte, practically all of which will, it is expected, be sent out this season.

Production of Bauxite and Aluminum

The production of bauxite in the United States in 1912 was 159,865 long tons, according to the U. S. Geological Survey. Compared with the output of the preceding year, these figures represent an increase of 4275 long tons. The states which produced bauxite in 1912 were, as heretofore, Alabama, Arkansas, Georgia and Tennessee. Arkansas led in production, as usual, but the output from this state was not so great as in 1911. In 1912 bauxite was mined for the first time on a commercial scale by the National Bauxite Co., in Carter County, Tenn., the exact location being about one mile northeast of Keenburg, a station on the Virginia & Southwestern Ry., about 4 miles north of Elizabethton, the county seat.

Though bauxite deposits are being found from time to time and though the present demand does not appear to tax unduly the known supply of the lower-grade material, the interest now being taken in the preparation of pure aluminum from clay, or other silica minerals, is worthy of note. As soon as a process for the extraction of aluminum from clay is put on a commercial basis, great quantities of low-grade bauxite, containing considerable admixtures of clay, will become available. That there is a large tonnage of such materials associated with most of the Southern Appalachian bauxite, is well known. This material should first be experimented upon before the non-bauxite clays, containing the smallest amount of alumina, are utilized.

There was an increase in the domestic production of metallic aluminum during 1912, but the large increase of the domestic consumption is chiefly due to the increase in import. Production of aluminum in pounds in the United States for 1912 was 65,607,000. The exports amounted to 1,347,621 pounds.

Tungsten Ore in Burma

Ores of tungsten and tin have been discovered practically all over the Tavoy and Mergui districts, in Burma, according to a letter from H. B. Osborn, United States Consul at Rangoon. A number of concessions are being worked. Wolframite is the main object of exploitation, cassiterite being a sort of byproduct, although at times the tin ore forms a larger percentage of the alluvial deposits than the wolframite.

It is practically impossible at this stage of development to give any figures showing what percentage of wolframite or cassiterite occurs in the lodes, as little lode mining has been done, but judging from the abundant alluvial deposits scattered over the hillsides near the lodes and by the appearance of the lodes themselves, there is ample justification for prospecting some of the lodes by adits. It is said that work of this nature is being carried out on several concessions.

The greatest part of the output of wolframite from the Tavoy district is obtained from the float deposits. The extent of float areas cannot at present be even estimated, but judging merely from the topographical features of the country in which they occur, they are of varying and often considerable extent and will yield ore in paying quantities for a long time to come. They are being exploited on the contract system, a miner being paid a certain fixed sum per agreed weight. The concentrates resulting from this class of work are very rich and sell well. The percentage of tin in the alluvial ground very often becomes an important factor, notwithstanding the fact that it occurs in practically negligible quantities in the lodes.

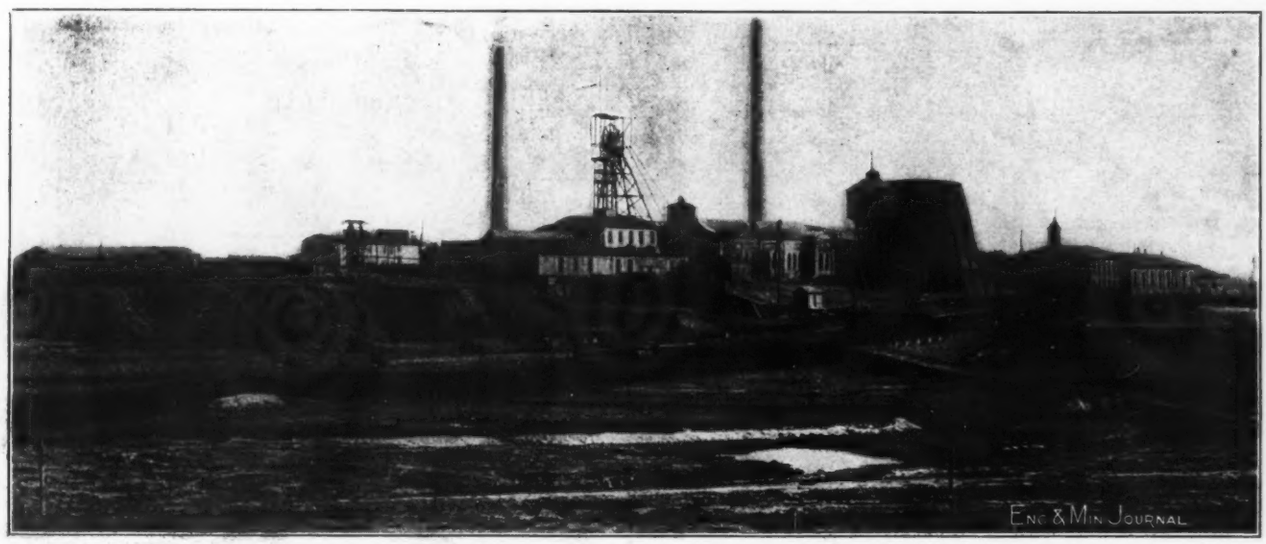
As mining in Tavoy is in its infancy, statistics of actual mining work cannot be given, but it appears that the laborers are continuously improving in efficiency. The natives work the deposits with pan, sluice box and rocker, and earn up to 48c. per day. It is estimated that the present cost of a ton of concentrates carrying 65 to 70% tungsten trioxide is about $300 delivered in England. This leaves the sellers a good profit at present prices, which are $7@7.50 per unit.

Allgemeine Deutsche Bergmannstag

By O. H. Hahn

SYNOPSIS—An account of the meeting of the German mining engineers society. This is marked by many social features, and by interesting excursions.

The twelfth Allgemeine Deutsche Bergmannstag (general convention of German mining men) was held at Breslau, the capital of the province of Silesia, Prussia, from Sept. 2 to 5. This is an informal organization similar to the International Geological Congress, the membership being optional from meeting to meeting. Only those are admitted as members who occupy a leading position in mining and metallurgical circles, or who are engaged in scientific pursuits relating to mining and metallurgy. Foreigners are admitted as members at the discretion of the executive committee. The meetings take place every three years in the first half of the month of September when an executive committee is elected to serve for the next term.



Hillebrand Shaft, Gottessegen Colliery, Upper Silesia

Proceedings at the Technical Sessions

The first day of the twelfth meeting was spent by visitors registering at the business office of the committee, receiving members' badges and tickets of admission to the various entertainments arranged for, and renewing old acquaintances. In the evening of Sept. 2 there was a civic reception by the city authorities in the stately old city hall, a fine monument of Gothic architecture. The customary collation was served in the various halls of the building, and speeches of welcome were made by the lord mayor and the chairman of the committee. In the morning of the following day the members of the convention assembled in Leopoldina Hall of the university, where the formal meeting was called to order at 9:30 a.m. by the chairman of the committee, "Berghauptmann" Schmeisser, the chief of the provincial mining department, in the presence of the Prussian minister of commerce and public works, the governor of the province of Silesia, the rector of the university, the prorector of the "Technische Hochschule" and other high dignitaries. Herr Schmeisser, who is well known, through his report on the gold resources of the Rand and of Western Australia to the Prussian government, in a well set speech extended a cordial welcome to the visitors, at the same time thanking the town authorities for their coöperation in the work of the committee to make it pleasant for them. Other speeches of welcome and thanks followed, whereupon the business portion of the meeting was taken in hand. A speech by the minister of commerce in which he asserted that the climax of the industrial boom had been reached and that we were now on a downward grade elicited considerable stir and comment in the press.

At the close of the business proceedings the prorector of the "Technische Hochschule" rose and conferred the degree of doctor engineer on Herr Schmeisser, on behalf of his institution, in recognition of the eminent services rendered by that gentleman to the mining profession. Papers were then read by the following gentlemen: (1) Professor Michael on the geological foundations of mining in eastern Germany; (2) Herr Bunzel on some observations on the sagging of the ground in consequence of sand filling in the mines of upper Silesia; (3) Herr Werne on carbonic-acid outbursts in lower Silesian mines; (4) Dr. Leimbach on the exploration of the interior of the earth by means of electric waves; (5) Herr Heimann on German mining ventures in the protectorates and in foreign countries; (6) Herr Schorrig on the employment of electric safety lamps in mines; (7) Herr Iversen on selection of modern safety devices for steam hoisting engineers; (8) Herr von Poellnits on architectonic ornamentation of industrial buildings with special regard to structures at mines in olden and modern times.

When the last speaker had finished the session was adjourned and the visitors repaired to the exposition grounds where an exquisite luncheon awaited them in

the grand restaurant, tendered by the committee. The remainder of the afternoon was spent according to the inclination of the individual members, some of them inspecting the exhibits on the exposition grounds, others repairing to town. Most all of them returned, however, in the evening to attend a grand banquet in the festival hall, an immense dome-like building destined just for such purposes and for concerts. After the conclusion of the banquet the visitors were given an opportunity to listen for a while to the majestic strains of the grand organ in the hall, said to be the largest in Europe, followed by a dance in the arena to gratify the tastes of the younger folks. The assemblage broke up about 2 a.m., Sept. 4.

Excursions to the Mining Districts

This day was devoted to an excursion into the mining districts of Upper Silesia. As about 1400 members, many accompanied by ladies, had signified their intention to participate, the committee had to divide the excursionists into as many groups as there were works to be visited, the number in a group being limited to 50 or 100, according to the size of the works and their ability to take proper care of their charges. The greatest rush had been for admission to the government works near Gleiwitz and to the von Giesche possessions near Kattowitz. Those who had been too late with their applications for admission were assigned to other groups.

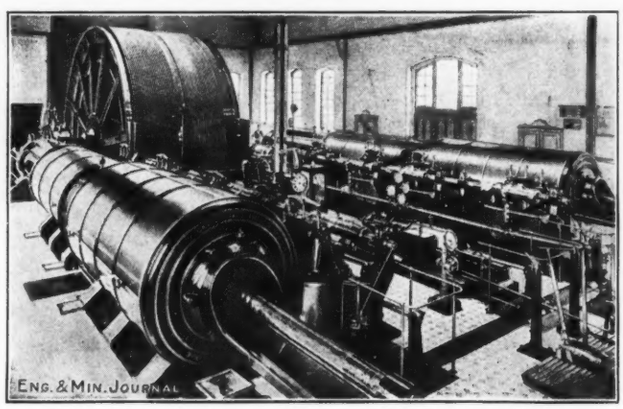
I, for one, was attached to the party bound for the works of the Silesia Mining & Zinc Reduction Co., at Lipine, and the Hillebrand shaft of the Gottessegen colliery, near Antonienhütte, belonging to the Counts Henckel von Donnersmarck. Two special trains pursuing different routes were provided by the committee to convey the visitors comfortably to the station nearest the place they wished to see. A three-hours' train ride landed me at Morgenroth, my getting-off station. Here carriages were in waiting to take the parties belonging to our group to the Silesia company's hotel at Lipine. On the way there we could observe smokestacks galore belching out volumes of smoke, and head gears and immense dumps of coal mines in close succession interspersed with settlements of brick buildings, indicative of an intense industry. Arrived at the hotel we were ushered into a large hall, presumably the dining hall, where, at the bidding of Herr Remy, the managing director of the Silesia company, we had to sit down to a substantial breakfast before proceeding to business.

At the conclusion of the breakfast Herr Remy favored us with an instructive lecture on the processes involved in the manufacture of zinc from the time the ore is extracted from the mine until it reaches the reduction works and leaves the rolling mill as finished product on the railroad. The lecture was assisted by an exhibit of the ores, smithsonite and sphalerite, both in the raw and the roasted state, of fuel and fluxes, crude and refined zinc, cadmium, sulphurous and sulphuric acid, cast and rolled metal, spikes, disks, etc., geological maps showing the mode of occurrence of ore and coal in Upper Silesia and drawings of the works and furnaces. At the conclusion Herr Remy gave each visitor permission to take along a souvenir from the specimens piled up on the table besides presenting us with a pamphlet on the "Schlesische Aktien-Gesellschaft für Bergbau und Zinkhüttenbetrieb," which contains an outline of its organization, history, etc., and some statistical notes. Thus prepared we proceeded under the leadership of Messrs. Remy and Köhler, the works manager, to the reduction works, where the grinding machinery for the ore, the sulphuric-acid plants, the roasting appliances, the smelting furnaces, the machinery for manufacturing muffles and finally the rolling mill were inspected.

The company treats principally ores from its own mines located about the town of Benthen and in Sweden, but receives also a limited amount of custom ores. It also owns a number of coal mines, one close to the works and others near the boundary line of Russia. There is enough oxidized ore left in the mines to make a favorable mixture of carbonate and sulphide of zinc possible. The zinc mines have dressing works attached to them, so that there is only a comparatively small quantity of blende that has to be ground up at the reduction works. The concentrates merely require drying before going through the roasting furnaces which are for the most part three-story muffle furnaces of the Rhenania type, only a few of the old Freiberg furnaces being left.

Strict SO_2 Regulations in Silesia

The reason for this is that the government regulations against the pollution of the air by the discharge of noxious gases are strict nowadays, so that the works where roasting is going on have been compelled to trap their sulphurous acid fumes and convert them into sulphurous or sulphuric acid. The Silesia company manufactures its sulphuric acid both by the lead chamber and by the contact process, the latter being the method practiced by the Grillo works, Oberhausen, Westphalia. It also makes a small quantity of anhydrous sulphurous acid for regular customers. In 1912 the Silesia works produced 51,117 metric tons chamber acid of 50° Bé, 7704 metric tons of contact acid and 2855 tons of anhydrous sulphurous acid. The chamber acid is used in the manufacture of fertilizers such as superphosphate and sulphate of ammonia, the contact acid in manufacturing dynamite and the sulphurous acid is sold to celluloid factories. Unfortunately Upper Silesia is too remote from the places of consumption of these articles to derive any profit from their sale, excessive competition and prohibitive railroad rates on acid are the contending factors.

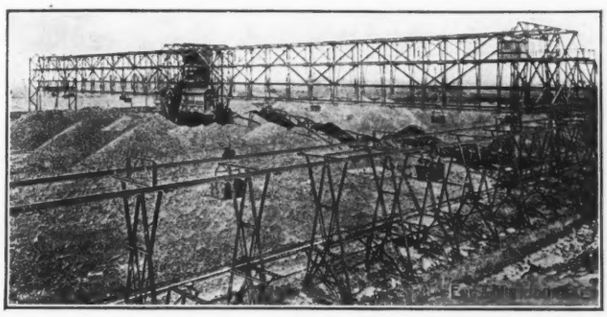


Winding Engine, Hillebrand Shaft

The zinc-distilling furnaces are distributed over seven large and lofty buildings; 100 of them are equipped with one tier of the large-sized Silesia muffles, 28 with three tiers of the smaller Rhenish muffles. The former are

made by hand, the latter by machinery. The fire-places of the furnaces with the Silesian muffles are supplied with undergrate blast, while the three tier furnaces are provided with gas producers and recuperators. The mixing of the charges is done by machinery, but the charging and discharging of the muffles are still performed by hand. The Lipine works turned out some 35,000 tons of crude zinc in 1912, besides 468 tons of lead and 11.8 tons of cadmium. Experiments made with smelting in the electric furnace have given negative results, the expense for current being excessive. Nor has electrolysis been successful.

The rolling mill has 11 steam engines, their respective horsepower ranging from 80 to 120. The exhaust steam from these and other auxiliary engines is stored in an accumulator and, in conjunction with live steam, used for feeding a steam turbine coupled to a three-phase dynamo, with surface condensation and auxiliary pumps



Coal-Storage Plant, Hillebrand Shaft

and cooling tower. This plant furnishes current for power and light to the Lipine works. To guard against emergencies it is duplicated. A narrow-gage railroad conveys coal, ore and other material to the works. The company owns additional works in other parts of the country.

The Hillebrand Coal Mines

Taking leave of our obliging hosts and guides upon our exit from this interesting establishment, we mounted our carriages again and were driven through the town of Antonienhütte to the Hillebrand pit already mentioned. Our first stop was at the rescue station of the mine where we saw the rescue crew and the fire brigade drilling. Then we moved on to the shaft proper, which is some distance off. Here we were received by the general manager and the mine manager amidst the blare of the Donnersmarck brass band in the hall of the club house, which was lighted by electric lamps, presumably to show the glass image of Santa Barbara, the miners' patron saint, conspicuous over the podium, to its best advantage. Successively we were shown over the hoisting works which are provided with Thomson hoisting gear, the engine and boiler rooms, the electric plant and the electrically driven plant for storing and loading coal which has some features in common with the Hulett unloader, and is considered of great value in the case of strikes. The dumping capacity is 200 tons per hour, the loading capacity 100 tons. The main shaft has two compartments and is a downcast one. Its section is 21.3 m., and its depth 509.8 m. It has a hoisting capacity of 2200 tons per eight hours. As an auxiliary an upcast air shaft may be used, which has a capacity of 750 tons per eight hours. The underground hauling is done entirely by electric locomotives, no animals being used. There are also five electric winches underground. The drainage is performed by hydraulic engines. The counts Henckel von Donnersmarck own coal concessions in upper Silesia aggregating approximately 73,000,000 sq.m., and are being developed through three collieries which turn out 2,200,000 tons annually with a crew of 5000 workmen. These notes are taken from a booklet with which we were presented by the management and do not pretend to exhaust the subject.

According to the program laid out for us our sightseeing expedition ended here and the balance of the day was given over to social intercourse. To begin with, we were invited by the managers to enter the miners' recreation grounds, which are separated from the premises of the shaft by a board fence and gate, and do justice to the good things laid out on a long row of tables while the miners' band discoursed gay music from a pavilion. Polish maidens in their national attire served coffee, liqueur and champagne, while the weed was dispensed by a boy moving about with a hand cart. A pretty incident was the distribution of packages of picture postcards to the visitors as they entered, by two young boys disguised as gnomes, who were stationed at the posts of the entrance gate. At the conclusion each visitor was handed a souvenir in the shape of a miniature mine car carved out of coal by an artistically inclined miner.

The afternoon was pretty far advanced when we left again in the carriages for Benthen, O. S., a fine, solidly built mining town of modern aspect. We were driven to the public play grounds where part of the other groups had already settled down to enjoy the hospitality of the town in the shape of a five-o'clock tea. The Prince of Pless's miners' band enlivened the place with music. At dark we drove in long procession to the concert hall, where, to cap the climax the town authorities had tendered us a final banquet. Needless to say that it was a great success! At last it was announced that our train would arrive at 8.45 p.m., and so we repaired to the depot to be taken back to Breslau by midnight. For Sept. 5, the last day of the convention an excursion had been arranged for the mountains of Lower Silesia, also by special train. While Upper Silesia presents a multitude of technically interesting objects, Lower Silesia has not much to show in this regard outside of its coal mines in the Waldenburg district and the fireclay pits of Neurode, which furnish the material for the muffles of the zinc works. The trip was, therefore, mainly one of pleasure and wound up in the "Kurgarten" of Bad Salzbrunn, a spa belonging to the prince of Pless, one of the largest landed proprietors in Silesia. A banquet in the Kurpark hotel and a grand illumination of the gardens concluded the entertainments, whereupon the members of the party returned to Breslau to disperse next day in all directions of the compass.

Great credit is due to the parties who combined in making the meeting such a grand success: The executive committee, the government authorities, the managements of the Prince of Pless', the counts Henckel von Donnersmarck's, the von Giesche possessions, the town corporations, and last, but not least, the "Oberschlesische Berg- und Hüttenmännische Verein," which caused the publication and distribution of five handsome volumes of monographs on the geology of eastern Germany and the mining industry of Silesia in particular with geological maps

attached. A map which will be particularly appreciated by new comers in Silesia is the one showing the occurrence and extent of the ore deposits of Upper Silesia in different colors according to the metal prevailing. Most of the mining papers, such as *Metall und Erz, Kohle und Erz, Braunkohle, Kali, Glückauf* and *Deutsche Bergwerkszeitung,* came out with special editions to honor the occasion.

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The Government and the Steel Corporation

The following pertinent and sensible communication appeared in the New York *Sun* of Oct. 7, 1913:

In view of the present depression of general business, brought about by the uncertainties of an untried fiscal system, the Administration may well inquire into the wisdom of further prosecuting the suit, inherited from its predecessor, by which the dissolution of the United States Steel Corporation is sought. Here is a huge industrial unit that, by the perfection of its organization, has revolutionized a whole industry, simplified and cheapened processes, improved products, developed an impressive foreign trade, reformed the relations of capital and labor, raised the standard of living of its employees, and by its ramifications has linked its fortunes with almost every other important business concern in the country. The prosperity of half a million stockholders and their dependents, and the welfare of a million employees and their families, are more or less affected by this litigation, which none but the most aggressive "trust buster" believes to have been commenced in good faith, and which, whatever its final legal outcome, can be productive of nothing but injury to the nation's best interests.

For 10 years the Steel Corporation flourished under the ægis of the government itself. New mills were erected, railroads were built, steamships bought, ore and coal deposits acquired, bonds were sold and shares were purchased by investors, all under the protection of the existing law; and the President of the United States himself stood sponsor for the act for which it has been most blamed. Most unjust and unfair it was when, for a transitory political effect, the very Administration that had assisted at the birth of this great industrial organization and openly rejoiced at its growth set in motion the legal machinery to destroy it. And equally unjust and unfair, as well as unwise, will be the present Administration if, indifferent to consequences, it continues the destructive work of its predecessor. Whatever political effect may have been sought prior to the Presidential election by this suit to dissolve the Steel Corporation, it has fully served its purpose and has now thoroughly exhausted itself. It should be quietly dropped into the oblivion that has overtaken the rest of the campaign material.

The phenomenal growth and success of the Steel Corporation is something of which the nation should be proud. Before its formation our foreign trade in iron and steel was practically nil, consisting mainly of the dumping of an occasional surplusage for which no home market was available. Last year our exports of finished iron and steel amounted to over $300,000,000. Of this 50% was the product of the Steel Corporation. Eleven years ago we imported 135,000,000 lb. of tin plate; last year less than one-twentieth of that amount, a change largely due to the Steel Corporation. At present we are annually making nearly 600 lb. of steel for every man, woman and child in the country. This is 10 times as much as is done by the rest of mankind. The manufacture of iron and steel, with all that it implies, is the most comprehensive measure of a nation's progress in the arts of civilization. It is a proud distinction for America that in this she leads the world.

While impressive in itself, the foreign trade which the Steel Corporation is rapidly building up has implications of supreme interest and importance, and any legislative obstruction to this trade must have far-reaching consequences. With the growth of the United States from 65,000,000 people to 95,000,000 in 20 years, a complete revolution has taken place in our industrial system, a revolution by no means unnoticed in itself but generally ignored in its effects.

The claims of the Steel Corporation for legislative sanity are manifold. It is in no sense a monopoly, nor has it at any time sought to restrain trade. On the contrary, it has won for our nation supremacy in the leading industry of the world. Before its time steel was graphically described as either a prince or a pauper; the prince has been deposed and the pauper elevated. A hundred millionaire capitalists have been supplanted by 150,000 shareholders. The autocratic rule of a small industrial oligarchy has been replaced by a democracy of small shareholders. It has elevated a commonplace business to intellectual levels. It has centralized manufacture and standardized products; by scientific experimentation it has improved processes and output; it has effected economies formerly undreamed of by reducing waste motion and effort; by comparative administration it has combined and concentrated the intelligence of managers upon constantly recurring problems of manufacture and distribution; it has eliminated business risks by a comprehensive system of mechanical accounting; it has given stability to the trade by scientific regulation of output to demand; it has established warehouses throughout the world where large stocks of steel, finished and unfinished, are kept ready for instant delivery, thus simplifying sales and abolishing market fluctuations. With all this it has humanized the business of converting crude ore into finished steel. It has taught the ignorant workman; it has elevated his home life, educated his children, and generally raised his standard of living. In sickness it has provided him with nurses, medical care and comfort. When injured or overtaken by old age it has pensioned him and driven the fear of penury from his mind.

That these results and more have been achieved in spite of political hostility and threatened legislative obstruction is the strongest kind of a reason why this hostility and obstruction should now cease. The abandonment of the government suit against this great organization might fittingly inaugurate a new Age of Reason.

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Disappointment is Felt in the Swastika District over the fact that so little outside money has come in. With the exception of some of the local people, no strong mining company has taken up any property in the camp. This is due partly to the fact that the discoveries are over-rated, and partly on account of high prices and terms. There are several companies in the field which are prepared to take up properties provided they can acquire them on a reasonable basis, but so far little has been done.

Increase of Well Temperature with Depth

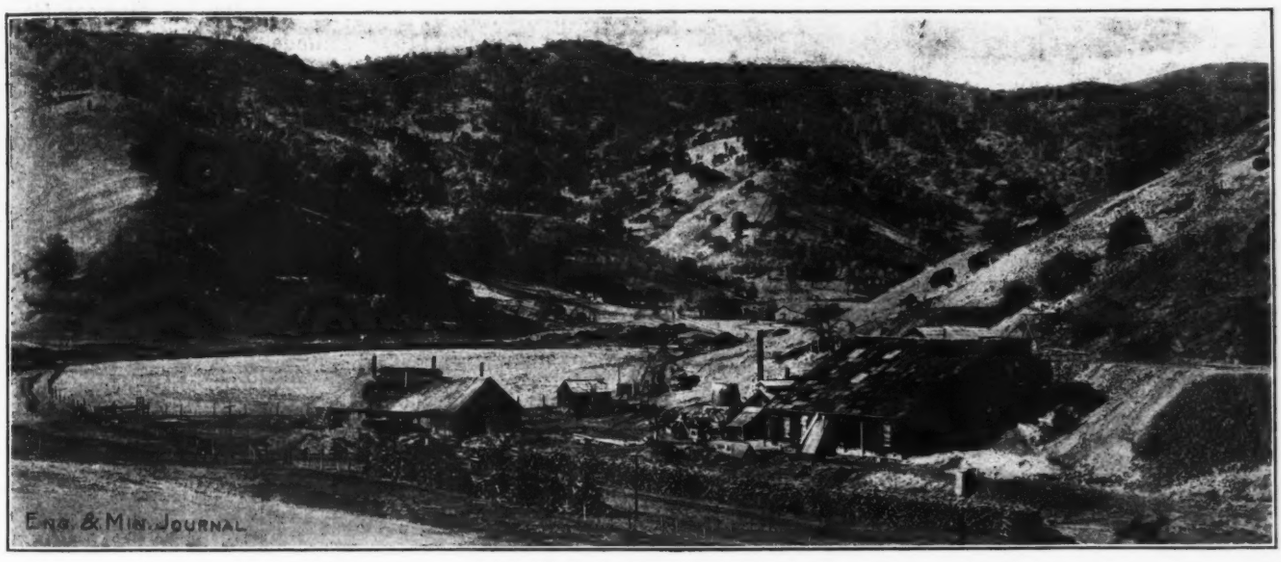
An oil well drilled to considerable depth at a point near Findlay, Ohio, was examined by the U. S. Geological Survey and the increase of the temperature with depth was measured by John Johnston. The results of his investigation are published in the *American Journal of Science,* August, 1913. Readings were taken at eight points in the well, beginning at the 100-ft. and finishing at the 2980-ft. point. In this distance the temperature after correction increased from 51.8° F. to 82.1° F., equivalent to a total increase of 30.3° F. This is an increase per 100 ft. of 1.052° F., or an increase of 1° F. per 95 ft. of depth. The figure is about an average, as determined previously in mine workings.

The method of obtaining the thermometer readings is of interest. Three thermometers were used, of the maximum-reading type. The object of using three was to check any errors that might result from jarring in raising the instruments. As a matter of fact, the readings checked closely. The three thermometers were inclosed in a thin-wall open copper tube, being held fast by short pieces of rubber tubing of appropriate size slipped about ½-in. over each end of each thermometer and kept in compression between the constricted lower end of the tube and a kind of a hinged lid at its upper end. The tube itself was suspended between two spiral springs in a sort of a cage built of stout wire. The cage again was attached, top and bottom, by open links to 100-ft.lengths of ⅛-in. steel-wire cable. The lower cable carried a weight, the upper was attached to the bottom of the bailer, which in turn hung as usual on the sand line and was raised and lowered with the engine. The weight minimizes the possibility of jarring, but it must be far enough below the thermometer so that the heat absorbed by it is not abstracted from the zone in which the thermometer is registering the temperature. A similar precaution must be taken with the bailer.

Concentration of Cinnabar Ores

By George V. Northey*

The milling process of reduction of cinnabar ores employed at the Manzanita Quicksilver mine in Sulphur Creek district, Colusa County, Calif., should be of interest to quicksilver miners, especially to those who have large deposits of low-grade ore that would not warrant the installation of furnaces. The Manzanita mine has produced a total of 2000 flasks of quicksilver, the largest part of which was produced in the eight years ending with 1912. All of this quicksilver was recovered by retorting the concentrates reduced from the cinnabar ores by milling and concentration. The ore is delivered from the mine to a No. 1 Gates breaker and broken so as to pass a 1-in. screen. From the crusher the ore passes to a 5-ft. Huntington mill where it is pulverized to 20-mesh; after which, without any sizing, the material is passed over six Gilpin County bumping tables. The tailings from these tables is put into cone separators, the lighter material flowing off and the heavier material passing over another concentrator where the remaining cinnabar is extracted.



Manzanita Quicksilver Mine, Sulphur Creek, Colusa County, Calif.

Large building housed the mill; the smaller the retort furnaces. The milling plant has since been removed to the Aetna mine, Napa County.

The Huntington mill is provided with regulating arms and screws which regulate the pressure of the rollers on the inside of the large ring or die. This insures not only steady pressure against the die, but also saves the wear of the roller rings and die. Before installing the regulating arms the roller rings in this machine wore into very irregular shapes and in doing so did not return against the die more than two-thirds of the time. By the use of this appliance the roller rings work smoothly against the die and fully 25% more material passes through the mill, and the results of the grinding are proportionately better than without the regulation. Another point gained by the regulating screws is that the cinnabar, as soon as crushed to the proper size, imme-

*Former owner and operator, Manzanita Quicksilver mine, Williams, Calif.

diately passes through the screens, and is not crushed by pounding, which slimes the cinnabar, while by the other plan, that is, with the use of regulating screws, the cinnabar passes through the screens immediately and a small amount of slime is produced.

The amount of ore capable of being passed through the mill depends entirely upon the gangue carrying the cinnabar. In actual work at the Manzanita mine we have passed through the mill from two to five tons of ore per hour, at the same time making concentrates averaging from 35 to 40% quicksilver, and in many cases as high as 68%, while the tailings for several months' milling averaged from 5 to 10c. per ton.

These concentrates are dried in the usual way and mixed with the proper percentage of lime, which varies from 10 to 25% lime. The concentrates are then placed in a D retort, or pipe retort, and heated to a dark red, commonly called cherry red, from 600 to 1000° F., according to the size of the material placed in the retort. The time required is from 10 to 12 hours to complete a thorough extraction of the mercury, after which the mercury is cleaned and placed in 75-lb. flasks in the usual manner.

The power required for this plant is about 25 hp., including the breaker and mill. The concentrators are driven by a separate engine to insure steady motion and using about ½ hp. to each machine. The motive power used is a 25-hp. four-cycle distillate engine, which is so arranged as to take the proper amount of gas (according to the amount of work being performed) at every cycle, making an absolutely steady motion. The water-cooling system is somewhat different from the system usually employed in engines of this description. In the usual system the water enters at a point near the exhaust valve and then passes out through an opening directly over the piston at the front end of the cylinder. With such system in operation during the summer time it was impossible to keep the engine cool, and it was sometimes necessary to shut down and let the engine cool off as a means of safety. After several delays on this account the system was changed, and instead of putting in the water at the exhaust valve, it was put in at the front end of the cylinder directly over the piston, and the regulating valve was placed in the water pipe above the cylinder. In operating this system the water was turned on in sufficient quantities to keep the exhaust valve cool. In other words, the water leaving the exhaust valve was 160° F. The result was that the front end of the cylinder was always cool, and the amount of lubricating oil was reduced more than one-third, while the combustion end of the cylinder was kept at the point at which the most effective work was accomplished. Some engineers may contend that the valve will heat and require more or less grinding. That this is not the case is proved by the fact that this engine was run constantly for nine years, and not a single valve in the engine has ever been reground.

The cost of milling during the time of operation and working of several thousand tons of ore, and including fuel, wages, deterioration, etc., was 60c. per ton of ore treated. This does not include the office expenses, but does include the wages of all the men in the mill. This cost is based upon the treatment of an average of two tons of ore per hour. Under some favorable conditions the cost of milling was reduced as low as 25c. per ton of ore treated. This low cost applied to ore that occurred in the form of sand, the common name in the camp being "brown sugar." The average value of the ore was about $5 per ton, or about 0.5% quicksilver.

Byproduct Coke Ovens in the United States

The accompanying list of byproduct coke ovens in the United States, Jan. 1, 1913, is taken from the advance chapter on coke from the "Mineral Resources of the United States" published by the U. S. Geological Survey. The number after each name represents the number of ovens.

Semet Solvay Ovens—Tennessee Coal, Iron & R.R. Co., Ensley, Ala. (240); Central Iron & Coal Co., Tuscaloosa, Ala. (40); Byproducts Coke Corporation, South Chicago, Ill. (280); North Shore Gas Co., Waukegan, Ill. (13); Indianapolis Gas Co., Indianapolis, Ind. (54); Kentucky Solvay Co., Ashland, Ky. (41); Solvay Process Co., Delray, Mich. (172); also at Syracuse, N. Y. (40); Empire Coke Co., Geneva, N. Y. (46); Cleveland Furnace Co., Cleveland, Ohio (100); Dunbar Furnace Co., Dunbar, Penn. (110); Philadelphia Suburban Gas & Electric Co., Chester, Penn. (40); Pennsylvania Steel Co., Lebanon, Penn. (90); also at Steelton, Penn. (120); National Tube Co., Benwood, W. Va. (120); Milwaukee Coke & Gas Co., Milwaukee, Wis. (160).

Otto-Hoffmann Ovens—New England Gas & Coke Co., Everett, Mass. (400); Camden Coke Co., Camden, N. J. (100); Hamilton-Otto Coke Co., Hamilton, Ohio (50); Pittsburgh Gas & Coke Co., Glassport, Penn. (120); Lackawanna Iron & Steel Co., Lebanon, Penn. (228); Northwestern Iron Co., Mayville, Wis. (36); Cambria Steel Co., Johnstown, Penn. (60).

United Otto Ovens—Citizens' Gas Co., Indianapolis, Ind. (100); Maryland Steel Co., Sparrows Point, Md. (200); Michigan Alkali Co., Wyandotte, Mich. (30); Zenith Furnace Co., Duluth, Minn. (50); Camden Coke Co., Camden, N. J. (50); Lackawanna Steel Co., Buffalo, N. Y. (188 ovens completed; 564 contracted for); Hamilton-Otto Coke Co., Hamilton, Ohio (50); Carnegie Steel Co., South Sharon, Penn. (212); Cambria Steel Co., Johnstown, Penn. (312).

Koppers Ovens—Woodward Iron Co., Woodward, Ala. (140); Tennessee Coal, Iron & R.R. Co., Corey, Ala. (280); Coal Products Manufacturing Co., Joliet, Ill. (35); Illinois Steel Co., Joliet, Ill. (280); Indiana Steel Co., Gary, Ind. (560); Inland Steel Co., Indiana Harbor, Ind. (65); Maryland Steel Co., Sparrows Point, Md. (6); Minnesota Steel Co., Duluth, Minn. (92); Republic Iron & Steel Co., Youngstown, Ohio (68).

Rothberg Ovens—Lackawanna Steel Co., Buffalo, N. Y. (282); Cleveland Furnace Co., Cleveland, Ohio (25); Lackawanna Iron & Steel Co., Lebanon, Penn. (5).

In addition to the above, the Central Indiana Gas Co., of Muncie, Ind., has 22 Klönne ovens, and the Lehigh Coke Co., South Bethlehem, Penn., has 300 Didier ovens, of which 150 were not completed at the beginning of the year.

The Canadian Pacific Ry. Will Use Oil in place of coal for fuel on the Vancouver-North Bend division, as soon as the locomotives can be converted from coal to oil burners at the railway shops in Vancouver. There are about 60 locomotives used on the division, and it will require a considerable time to make the change.

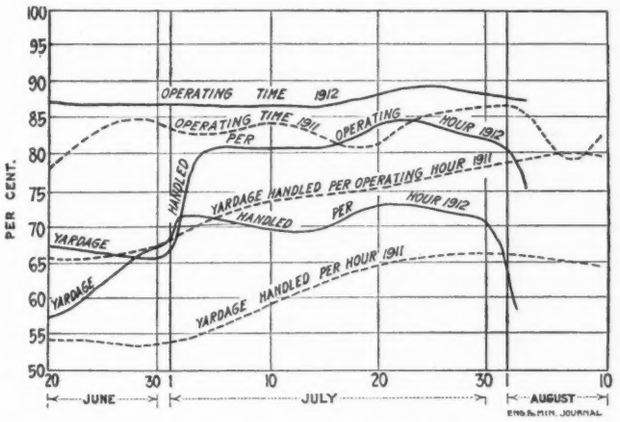
DETAILS OF PRACTICAL MINING

Results of Incentive Bonus

By Dr. Henry M. Payne*

An interesting illustration of the results of an incentive bonus is to be found in the records of one of the large gold-dredging companies operating in the Yukon Territory. As is known, the open season there averages only about 150 days, from the middle of May to the middle of October, and a careful study of the 1911 records developed the fact that the maximum operating efficiency is never reached before the latter part of August, and then quickly begins to drop off preparatory to closing down early in October.

In designing a bonus system to meet existing conditions, there were many contingencies to consider. The question of a proper thawing of the ground, thorough washing of the material dredged, freedom from stoppages, etc., all entered into the problem. The results which it was desired to attain were:



Graphic Representation of the Results of a Bonus System in Dredging

(1) To increase the average operating efficiency of the entire group of dredges, thus increasing the net revenue therefrom; (2) to reach the maximum operating efficiency of the group early in July, instead of the latter part of August; (3) to enable an intelligent selection from the available men for such promotions as might be open; (4) to secure real coöperation on the part of all concerned.

The dredge efficiencies were increased by: (1) Reducing the frequency and length of total stoppages; (2) increasing the average proportion of capacity utilized while operating. The relative efficiency of the different operators was likewise determined by comparative records of operating time maintained and percentage of capacity utilized.

The dangers to be safeguarded against were: (1) Paying prize money or bonuses without actual equivalent return to the company; (2) slighting of valuable material for the sake of making large yardage records; (3) false records and unfair reports; (4) loss of discipline; (5) committing the company to a possibly undesirable precedent.

It was then recommended that for each 1% of increase over the average efficiency for 1911, 10% of all the silver returns from the cleanups of this period be donated for prize money. These prizes were to be awarded on the bases of: (1) Highest percentage of possible operating time; (2) highest percentage of possible capacity utilized while dredging; (3) best net record of total time and capacity; (4) best single-shift record. Handicaps were allowed for dredges having badly worn buckets; dredges were rated for capacity at a normal voltage; allowance was made for gravel and bedrock dug and for frozen material, etc.; falsification of any record penalized the offender by elimination from any participation.

A comparison of the relative curves for 1911 and 1912 in the accompanying chart shows the results attained. The operating time, which always before had been a fluctuating quantity, now became regular. The yardage handled per hour (24-hr. basis) and per operating hour exceeded the highest previous record and maintained this efficiency until the close of the month, when word having gone out that the experiment would not be in effect the following month, everything dropped back to subnormal.

The psychology of the incentive bonus, thus again demonstrated, proves conclusively that the solution of the labor-capital problem lies largely in combining the cupidity of the employee with a fair division of the excess profits of the employer, through a carefully devised system, which will insure improved product as well as increased output, and which at the same time guarantees a minimum wage to the employee.

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Mechanical Efficiency in Hoisting

Tests made on some of the hoists in Butte indicate that the chief friction losses in hoisting take place elsewhere than in the engine ("Bull." A. I. M. E., September, 1913). This was proved by the fact that in all cases the percentage of friction was less when hoisting out of balance with one drum or reel held by the brake than when hoisting in balance. Thus it was found that for hoisting from a depth of 2200 ft. the friction of the engine, rope, skip and cage, including windage, was as follows: Speculator shaft, 21.1% in balance, 13% out of balance; High Ore shaft, 23% in balance, 17.5% out of balance; Diamond shaft, 29% in balance, 10% out of balance.

The friction was determined by hoisting a weighed load and taking continuous indicator diagrams over the trip. The total friction is the difference between the indicated work and the work performed in the shaft. The percentages just given are referred to the indicated work. Defects in the shaft are responsible for many of the high percentages of friction, and in some cases it was found that one compartment was more defective

than the other. In the Diamond shaft this condition existed, accounting for the great difference in friction loss whether hoisting in balance or out of balance, that is, with both cages or with one. In another shaft the extremely high friction loss of 40% was found, but this shaft was known to be in bad shape at the time. The lowest friction losses were obtained with hoisting at a low speed, and the increases of loss with high speed indicate that the effect of windage is greater than has been generally assumed. Few data are available on the friction losses in hoisting.

Results of Drill-Steel Tests on the Rand

The Mines Trials Committee on the Witerswatersrand has published a report of the tests conducted for it by Robert Allen, on various kinds of steel for rock-drill bits. The object of the test was to determine the steel most suitable for use in the Rand mines and also to standardize the heat treatment. The report is of value to a certain extent, but the tests, extensive as they are, leave much to be desired from the standpoint of American practice. We publish herewith a table, showing the most significant results, compiled from a series of tables accompanying the report. The table covers the most satisfactory steels, as evidenced by the efficiency factor adopted in the report. It is limited to the steels of which more than 20 pieces were tested, the maximum number of pieces of any one steel which were tested being 243, this steel being the second of those rated at 179 in the last column. Only the results on the starters are included, since the followers, whether three or four in number, were all made with a chisel bit. The cross-bit starters themselves, made of 1½-in. cruciform steel, had a low center instead of the high center which is rapidly becoming standard in America and which seems both theoretically and practically the correct shape. Chisel bits also are rarely used in this country; it seems logical that the use of as many cutting edges as possible on the bit would enable it to stand up longer, probably to cut faster, and it seems in practice also to make it less liable to fitcher the hole.

While not specifically stated, it appears that no hand steel was tested, but whether a piston or hammer machine was used is not stated. It has been found in America that drill steel receives much harder service in hammer than in piston machines. No observations seem to have been made on shank breakage. This is a most troublesome feature of drilling, causing delays, loss of steel and increased labor in the blacksmith shop. It seems probable that the drills were sharpened by hand only. No mention of machine sharpening is made, although the machine sharpener is now pretty generally admitted not only to increase the output of the blacksmith shop, but to furnish a much better, especially a more uniform bit.

Referring to the table, the analyses of everything but carbon were made on octagonal bars; they are, however, probably approximately correct for the cruciform bars on which the drilling tests here recorded were conducted. The rating for appearance refers to the general appearance after drilling and is based on a possible 10. The diameter of the bit is the reaming diameter, that is the largest diameter possible across the bit. "Chipping" is described as the loss, during drilling, of small flat pieces not exceeding $\frac{3}{16}$ in. in diameter. "Flaking" is the loss of larger pieces in drilling. "Scaling" refers to the material lost by the formation of oxide in heating. The "cutting-off" process is necessary with drills that have lost pieces so large as to deform them. The efficiency factor of the last column is got by dividing the figure given as the rating for general appearance by the percentage reduction in hole area per inch drilled and dividing the quotient again by the loss in weight per inch drilled.

The report states that the alloy steels, so called, although often giving good drilling results (one of them heads the list) require so delicate a heat treatment as to

TABLE OF RESULTS OF DRILLING TESTS ON THE MORE EFFICIENT CRUCIFORM STARTERS

Method of manufacture	% C	% Si	% S	% P	% Mn	Alloy	Inches drilled	Appearance	Starting diam., in.	Finishing diam. in.	Diam. loss, in.	% reduction, hole area	% reduction, hole area, per in.	% of drills, chipped	% of drills flaked	Grams lost in drilling	Grams lost per in. drilled	Grams lost, scaling,	% of drills cut off	Grams lost, cutting off	Total grams, lost	Price, cents per lb.	Cents per in., drilled	Drilling efficiency factor
C.	0.39	0.77	0.01	0.011	0.33	*a*	13.4	8.4	1.93	1.85	0.08	8.1	0.61	0	0	6.4	0.48	8.9	23	20.2	35.5	18.0	0.106	289
S. B.	0.67	0.15	0.01	0.023	0.23	....	13.4	8.5	1.93	1.85	0.08	8.1	0.60	3	3	6.7	0.50	8.2	0	0.0	15.6	8.0	0.020	283
O. H.	0.68	0.19	0.01	0.025	0.32	....	12.8	8.0	1.94	1.86	0.08	8.1	0.63	15	9	5.9	0.46	6.6	15	11.6	24.1	6.5	0.028	276
C.	0.83	0.10	0.01	0.017	0.33	*b*	13.5	8.0	1.93	1.86	0.07	8.1	0.60	9	10	7.1	0.52	5.9	64	68.9	82.4	13.0	0.170	258
O. H.	0.68	0.06	0.01	0.021	0.22	....	14.1	7.5	1.94	1.85	0.09	9.0	0.64	4	4	6.8	0.48	8.9	21	36.9	52.6	7.0	0.056	242
C.	0.78	0.12	0.01	0.027	0.23	....	14.7	8.3	1.93	1.83	0.10	9.9	0.68	6	0	7.6	0.52	6.7	11	5.5	19.8	9.0	0.024	237
O. H.	0.64	0.09	0.02	0.022	0.32	....	12.3	8.1	1.94	1.86	0.08	8.6	0.70	7	4	6.1	0.50	6.5	7	5.7	19.1	7.0	0.022	231
C.	0.80	0.14	0.01	0.016	0.32	....	13.5	8.0	1.93	1.83	0.10	9.6	0.71	9	7	6.8	0.50	7.1	15	12.3	26.2	12.0	0.050	222
C.	0.83	0.07	0.02	0.023	0.27	....	15.4	7.9	1.93	1.83	0.10	9.7	0.63	11	21	8.7	0.56	5.2	25	23.6	37.5	9.1	0.048	219
C.	0.71	0.08	0.02	0.028	0.40	....	13.1	7.8	1.93	1.83	0.10	10.5	0.70	20	17	7.5	0.52	6.6	60	63.5	77.6	8.9	0.106	211
C.	0.82	0.07	0.01	0.022	0.27	....	12.5	7.6	1.96	1.87	0.09	9.0	0.72	14	11	6.3	0.50	6.3	3	7.8	1.5	8.5	0.024	211
O. H.	0.65	0.08	0.02	0.024	0.40	....	13.2	7.5	1.92	1.83	0.09	9.1	0.71	6	6	8.2	0.55	4.8	25	14.5	27.5	9.0	0.032	208
C.	0.65	0.15	0.01	0.016	0.34	....	13.2	8.1	1.94	1.85	0.09	9.0	0.68	2	8	7.8	0.59	6.5	48	44.0	58.6	9.0	0.086	203
C.	0.88	0.09	0.01	0.020	0.33	*c*	14.4	7.5	1.92	1.83	0.09	9.1	0.63	19	17	8.6	0.60	6.7	18	13.2	28.6	9.0	0.040	198
C.	0.81	0.10	0.01	0.016	0.24	....	14.7	8.0	1.93	1.83	0.10	10.1	0.69	17	39	8.9	0.61	7.1	14	7.5	24.2	11.25	0.040	191
O. H.	0.65	0.06	0.02	0.009	0.32	....	13.7	8.2	1.95	1.83	0.12	11.9	0.87	3	2	7.0	0.51	7.7	5	4.1	18.8	7.0	0.022	187
C.	0.72	0.07	0.02	0.025	0.38	....	12.0	7.8	1.93	1.84	0.09	9.3	0.76	7	12	6.6	0.55	8.3	31	27.1	42.0	8.0	0.062	186
C.	0.71	0.11	0.02	0.022	0.36	*d*	13.5	7.7	1.94	1.84	0.10	10.0	0.74	16	19	7.7	0.57	6.4	67	78.1	92.2	12.0	0.180	183
C.	0.84	0.08	0.02	0.026	0.35	....	14.1	6.5	1.93	1.83	0.10	10.0	0.71	8	18	8.5	0.60	7.2	11	6.8	22.5	7.75	0.028	179
C.	0.69	0.20	0.01	0.039	0.37	*e*	13.5	7.9	1.95	1.83	0.10	10.1	0.64	4	16	7.9	0.48	7.6	60	55.7	71.7	9.0	0.102	179
C.	0.73	0.15	0.01	0.033	0.39	....	10.5	7.9	1.91	1.83	0.08	8.2	0.78	5	20	6.5	0.62	6.8	0	0.0	13.3	7.5	0.022	165
O. H.	0.61	0.06	0.01	0.032	0.21	....	14.2	7.9	1.94	1.82	0.12	12.0	0.84	20	16	8.2	0.58	8.0	0	0.0	16.2	9.25	0.022	161
C.	0.77	0.02	0.01	0.022	0.26	....	12.8	7.8	1.91	1.81	0.10	10.7	0.84	6	12	7.8	0.59	8.2	22	17.6	33.3	9.0	0.052	156
C.	0.69	0.18	0.03	0.015	0.47	....	14.2	7.8	1.93	1.82	0.11	11.3	0.79	11	11	8.9	0.63	16.7	64	92.3	117.9	9.5	0.174	156
E.	0.69	0.13	0.02	0.026	0.18	....	13.0	7.3	1.93	1.83	0.10	10.5	0.81	8	11	7.6	0.58	7.5	4	2.1	17.2	8.5	0.024	155
C.	0.80	0.07	0.01	0.023	0.25	....	13.5	7.6	1.97	1.87	0.10	10.0	0.76	6	10	9.0	0.67	6.7	4	3.0	18.7	8.5	0.026	149
E.	0.79	0.15	0.02	0.023	0.24	....	15.1	7.7	1.90	1.78	0.12	12.3	0.82	6	0	9.9	0.65	6.2	0	0.0	16.1	8.5	0.018	145
C.	0.74	0.04	0.01	0.027	0.32	*f*	14.8	7.1	1.91	1.79	0.12	12.2	0.83	7	17	8.7	0.59	12.0	44	24.5	45.2	7.5	0.050	145
C.	0.63	0.03	0.02	0.034	0.51	....	14.5	7.2	1.94	1.83	0.11	11.0	0.76	5	27	9.8	0.68	7.5	87	92.5	109.8	8.0	0.134	141
O. H.	0.68	0.11	0.02	0.027	0.30	....	14.3	7.5	1.92	1.81	0.11	11.3	0.79	1	29	10.2	0.72	6.2	23	19.2	36.2	7.0	0.036	134
C.	0.46	0.15	0.01	0.033	0.31	....	14.1	7.8	1.94	1.82	0.12	12.3	0.87	7	0	9.5	0.67	6.8	0	0.0	15.9	14.5	0.038	132
C.	0.70	0.11	0.01	0.015	0.33	....	12.3	7.1	1.93	1.82	0.11	10.8	0.88	5	5	10.3	0.84	9.1	21	34.9	54.3	10.0	0.096	96
C.	0.80	0.40	0.02	0.033	0.37	....	10.1	7.7	1.93	1.83	0.10	10.8	1.07	19	19	8.7	0.86	5.2	64	91.3	105.2	10.0	0.228	84

a Vanadium, 0.06%; tungsten, 1.92%. *b* Aluminum, 0.22%. *c* Aluminum, 0.20%. *d* Chromium, 0.87%. *e* Chromium, 0.20%; vanadium, 0.05%.
f May contain chromium. C. = Crucible. O. H. = Open hearth. S. B. =Swedish bessemer. E. = Electric.

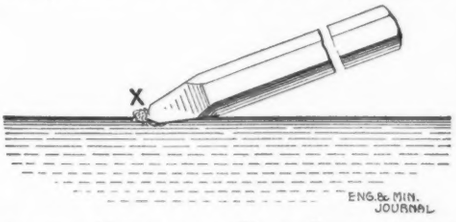
make them unserviceable even without considering their higher price per pound. This has also been found true in America. A good, clean, high-carbon steel gives results most satisfactory in all respects. After eliminating from consideration the steels for which more than 20% of the pieces had to be cut off and those of which more than 20% of the pieces flaked in drilling, those whose heat treatment was difficult and those whose drilling efficiency was low or cost of steel per inch drilled high, and making some further allowances, the report averages the analyses of the remainder and obtains as the best formula for the drill steel: Carbon, 0.66%; silicon, 0.09%; sulphur and phosphorus together, 0.036%; and manganese, 0.28%.

It is noted that the ends of a bar are usually inferior to the inside portion and are therefore unsuitable for a bit. Inasmuch as a shank is equally sensitive and a weld also requires good metal, it would appear that the only safe rule is to throw away the ends of the bars. No advantage seems to accrue to any one type of manufacture, crucible, openhearth, Swedish bessemer and electric steels appearing in the list, although the electric steels are near the bottom, possibly because few of them were tested.

Tempering Hand-Drill Steel

By Albert G. Wolf*

A simple but satisfactory method of tempering hand-drill steel was originated by John Sommers, foreman of the Blue Jay mine of the Mason Valley Mines Co., and



Convenient Method of Hand-Steel Tempering

is in use at that mine. It consists of heating the drill to a dull red for a distance of about 1 in. back from the edge of the bit, then placing one side of the bit just flush with the surface of the water, as shown in the illustration. The water will climb up on the bit at *X* as long as sufficient heat remains in the steel. When the water ceases to climb, remove the steel and allow it to cool slowly. At the time of removal the temper is extremely hard, but the heat remaining in the steel will draw back into the bit and toughen it. Drills sharpened in this manner never check, as the first cooling is almost uniform throughout; corners of the bit are rarely broken off; and the edge of the bit is resistant to the wear against hard rock. The temper can be regulated closely by the degree of water cooling.

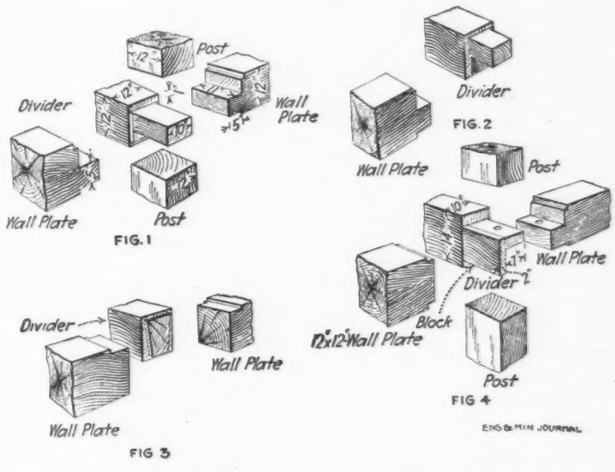
Hoisting Curves for Drum and Reel Engines showing the variations in speed in different parts of the trip are rather dissimilar. Thus for a typical drum hoist (A. I. M. E. Bulletin, September, 1913), a rapid acceleration is represented by a rising speed line, which gradually falls off and becomes relatively flat over a period of 20 sec., the speed being almost constant; this is followed by a sharply dropping line representing the retardation. For the reel hoist, however, acceleration continues for half the trip, as indicated by a rapidly rising speed curve, and the remaining half of the trip is the retardation period represented by a dropping line. There is practically no time when the hoisting speed is uniform.

*Mason, Nevada.

Wall-Plate Splices

The use of spliced wall plates is becoming increasingly common in Butte. Not only is long timber more difficult to obtain but the spliced plate is more convenient to handle in the shaft bottom, particularly when heavy ground makes it necessary to keep the bottom set close to the bottom of the shaft. The use of a spliced plate, however, doubles the number of hanging bolts necessary. (A. I. M. E. Bulletin, August, 1913.)

The splice in most general use is that shown in Fig. 1. It offers the advantage of supporting the divider while the step is being blocked. In case operations are conducted by sinking two or more compartments and then enlarging to the full size by raising, a splice like that shown in Fig. 2 is used. In this case the miter is omitted, inasmuch as dirt, which is likely to get into the joints, has less opportunity to throw the straight-framed joint out of line. While the shaft is being sunk, the opening left under the divider by this method of framing is filled with a block of wood; this is chopped or picked out again



Various Butte Methods of Splicing Wall Plates

when the set is reached in raising and it becomes necessary to place the other half of the wall plate.

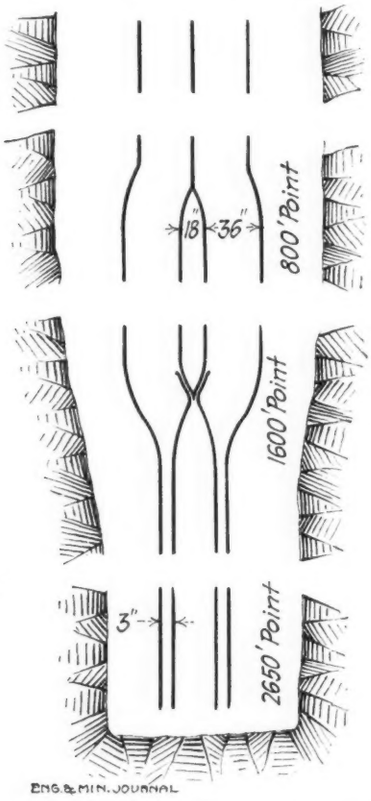
In Fig. 3 is shown a spliced joint, which is easy to frame, but with which it is necessary to support the divider, while the set is being blocked. This support is effected usually by nailing the divider to the wall plate after the posts have been placed. At the Tropic shaft, the set is blocked at both sides of the center of the divider temporarily, the end blocks are set and then the blocks on each side of the divider are removed, the set brought to line and blocked permanently. In some cases a temporary post is stood under the divider to hold it while being blocked. This method of splicing is cheaper to frame, but more expensive to place in position.

In Fig. 4, the method of splicing used by the High Ore mine is exhibited. It is applicable to cases where a small shaft is being sunk, with the possibility that more compartments will be added later. A 2-in. block is nailed to the divider before it is sent down the shaft and the corner between this divider and the half of the wall plate is held with a pin. When it becomes necessary to enlarge, the other half of the wall plate can be easily pushed in, since the distance is small. The splice is not so strong as that shown in Fig. 1.

It should be noted that sinking the whole shaft at one operation is cheaper than sinking part of it and raising the rest. In soft ground, however, it becomes undesirable to open up too much country at once and the Anaconda company them finds it of advantage to sink and raise.

Novel Incline Track Arrangement

The working shaft of the Sterling Iron & Ry. Co., at Lakeville, N. Y., is in the orebody and follows approximately the flat-dipping foot wall. The foot wall is extremely irregular and while some of the rolls are followed by the shaft, it was necessary to cut through some of the sharper ones. In order to reduce the width of these cuts and also to save a certain amount on rails and



METHOD OF ECONOMIZING EXCAVATION IN INCLINE DOUBLE-TRACK SHAFT

ties, a rather ingenious method of arranging the tracks was resorted to. Hoisting is done in balance from several levels so that provision had to be made for the skips to pass. From the top of the headframe to the 800-ft. point, three rails are used. This is not an unusual method on inclined planes and results in saving the cost of one rail, a certain amount in the length of the ties and some rock cutting. At the 800-ft. point a change is made to four rails, two complete tracks, in the manner shown, no switch being necessary. The tracks are continued to the 1600-ft. point and the two skips can pass anywhere between these points. From the 1600-ft. point down, it was desired to carry the shaft as narrow as possible, but the management was unwilling to risk possible accident from the use of the switch which would have become necessary if a single track, that is, two rails were there used. The safety of a hand-operated switch at such a point depends on the memory of the operator as to which track the last skip was sent over, and an automatic switch is liable always to get out of order. The scheme illustrated was conceived and has given excellent satisfaction. While it uses four rails, no increase in the length of the ties is necessary and not much in the width of the cut over that required for a single track and the saving over the three-rail system used in the upper part of the shaft is appreciable. No switch is required at the 1600-ft. point to change to the two-track portion. The arrangement continues to the bottom of the shaft at 2650 ft. below the collar.

It should be stated that there are no compartments in the shaft, no timber whatever being required with the excellent hanging; the shaft is quite open, really a part of the stopes in places.

Safety Rules—Ropes and Sheaves*

(1) All ropes or cables used for hoisting or lowering either men or material, except in test pits, shall be composed of iron or steel wires with a factor of safety prescribed by the mechanical department.

(2) New rope or cable shall supersede an old rope or cable either when the number of breaks in any running foot of said rope exceeds 10% of the total number of wires composing the rope, or when the wires on the crown of the strands are worn down to less than one-half their original diameter, or when the specified inspection provided for in these rules shows marked signs of corrosion.

(3) All rope should be superficially inspected once in every 24 hr. by some competent person designated for that purpose, and there shall be an examination made once in every three months of a section of every rope or cable then in use for hoisting and lowering in the mine. If upon inspection any hoisting rope or cable is found to be below the requirements it shall be disused for such purpose forthwith.

(4) Every rope used for hoisting or lowering should be securely fastened to its drum and when in use shall never be fully unwound, but at least two full turns shall remain on the drum.

(5) The further end of the hoisting rope should either be securely fastened within a tapered socket or else it should be bound around an oval thimble and then fastened to itself by not less than six clamps or bolts.

(6) Every hoisting rope shall be treated with oil or some suitable rope compound at least once every month. This compound should be chemically neutral and of such consistency as to penetrate the strand and not merely cover the surface of the rope.

(7) Worn or broken places in ropes shall be reported at once to the proper person.

(8) Sheave stands should be provided with convenient stairs or ladders. Railed platforms should be provided at the sheaves convenient for oiling.

(9) If practicable, sheaves should be guarded to prevent anyone from getting his hand caught between cable and sheaves.

(10) Sheaves in shaft houses should be railed and arranged so as to be easily accessible.

(11) Where a hoisting rope crosses a roadway at a point lower than 14 ft. above the road, protection should be provided thereunder.

*From Inland Steel Co.'s book of rules.

DETAILS OF METALLURGICAL PRACTICE

Water Spray for Dust Settling

According to the report of the British Alkali Inspector for 1912, at smelting works much improvement has resulted from the use of water sprays to assist in the deposition of the finely divided solid particles carried away from the furnaces along with the smoke, but the diminution of the amount of acid gases sent into the air from many works of this class is regarded as a problem still awaiting a satisfactory solution. Experience suggests that it would be advantageous to bring works in which blende is calcined under the same regulations as now apply to arsenic works treating ores containing a considerable proportion of sulphur. Objections have been raised to the use of water spray in large flues or chambers for the removal of fume, etc., on the ground of the reduction of temperature involved, but it is pointed out, as not generally known, that the weight of gas or air removed by a chimney is almost at its maximum at a temperature of 250° F. (175° C.) above the atmospheric temperature, and observation of the temperature of the chimney gases is recommended as an easy way of controlling the amount of water spray to be used. Water-spray jets should be in such a position that the spray is at once directed into the full current of the gases and carried along with them.

❋

Cleaning Dwight & Lloyd Grates

At one of the lead-smelting works where Dwight & Lloyd sinterers are used it was formerly necessary to keep a man at each machine to punch open the slots of the grates. This man was eliminated by casting the grates with the slots parallel with the longitudinal axis of the machine, this permitting the installation of a simple mechanical cleaner. The latter consists of a series of ordinary iron washers, strung on a rod with intervening separators, so that each washer registers with a slot in the grate. The rod carrying these washers is hinged at the ends. The movement of the grate lifts the rods with its washers and causes it to fall in one row of slots which are thus effectually cleaned. On the next movement of the grate the washers are lifted and on the next they fall into the next row of slots, all the movements being suitably timed, of course. This device was an invention in the works. A patent has been applied for.

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The Manufacture of Paving Bricks from Blast-furnace Slag has become an important and flourishing industry in the Middlesborough iron district in England. Several companies are engaged in the work. The bricks are molded by machine from the molten slag and after hardening are annealed in a special furnace. About 160 brick to the ton of slag is the usual output.

Study of Leaching Processes

A basis for the study of leaching processes is explained in the September issue of the *Colorado School of Mines Magazine*, by Robert B. Elder, of the Chiksan Mining Co., Chosen. According to this system, the solution from a leaching vat is measured for successive short periods of time, samples being taken meanwhile, which are assayed and analyzed. The total leaching period of the charge is covered by the samplings, each of which, however, should be of short duration in order to differentiate the constantly changing rates of solution.

Results from a set of samples covering the treatment of a charge may be plotted, as shown in the accompanying diagram, different colors being used to represent the different elements. Plotted thus, the ordinate of any point on the gold-production curve represents the rate in dollars per hour at which the gold comes from the tank,

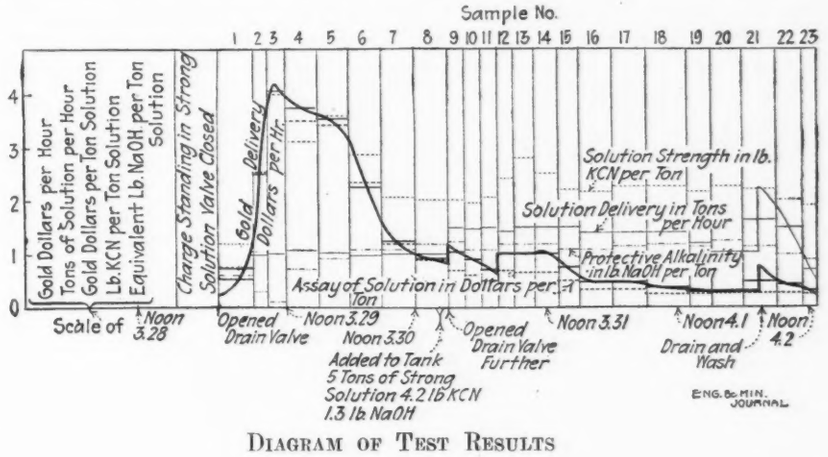

Sample No.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Gold Dollars per Hour
Tons of Solution per Hour
Gold Dollars per Ton Solution
Lb. KCN per Ton Solution
Equivalent Lb. NaOH per Ton Solution
Charge Standing in Strong Solution Valve Closed
Gold Delivery Dollars per Hr.
Solution Strength in lb. KCN per Ton
Solution Delivery in Tons per Hour
Protective Alkalinity in lb. NaOH per Ton
Assay of Solution in Dollars per Ton
Scale of
Noon 3.28
Opened Drain Valve
Noon 3.29
Noon 3.30
Added to Tank 5 Tons of Strong Solution 4.2 lb KCN 1.3 lb NaOH
Opened Drain Valve Further
Noon 3.31
Noon 4.1
Drain and Wash
Noon 4.2
ENG. & MIN. JOURNAL

DIAGRAM OF TEST RESULTS

and the area under the line represents the amount of gold delivered. This is, of course, upon the supposition that the rate of change in assay is a constant in the period between taking consecutive samples. However, it is plain that while this condition is not exactly fulfilled, the error is negligible.

Suppose the cost of allowing the percolation to continue be ascertained and plotted on the sheet in terms of the same units as the gold production. The time at which the percolation should be discontinued and the tank recharged in order to obtain the greatest net profit per ton under those conditions of operating, is at the point of intersection of the gold-extraction line and the cost line. In order that this may be strictly true, however, the gold-extraction line must be corrected to allow for the losses and cost of precipitation and melting.

At the cyanide plant of the Chiksan Mining Co., Chosen, treating accumulated tailings from a 40-stamp mill, the information derived in this way has enabled us to increase the extraction from 75% to 85% on $2 material at an increased treatment cost of 5c., giving, therefore, an addi-

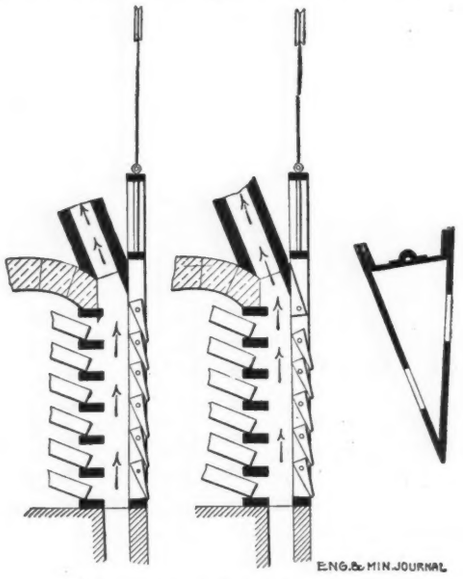
tional net profit of 15c. per ton treated. The present cyaniding cost is $0.44 to $0.46 per ton.

The ore here is quartz carrying free gold and small amounts of auriferous pyrite. It is stamped through 40-mesh screen, amalgamated, and concentrated on Standard tables. The tailing is held in two settling ponds and the mill water, containing slime equal to about 12% of the original ore, is run to waste. The tailing from these settling ponds is loaded into the cyanide leaching vats by native coolies. Lime equivalent to 1½ lb. CaO per ton ore is added with the charge.

Explanation of the diagram: At 6 p.m., Mar. 18, the charging was completed and solution carrying 3.5 lb. KCN and protective alkalinity, equal to 1.3 lb. NaOH per ton, was added till the charge was covered. This was allowed to stand till midnight, when the drain valve was opened. As the solution was drawn off, solution carrying 2 lb. KCN and 1.2 lb. protective alkalinity was added, so that the charge was always covered. Between the hours of 4 and 5 p.m. on Mar. 30, instead of weak solution five tons of strong solution were added. This began to appear in the discharge about 10 hours later and its results are apparent in the lifting of the KCN, gold delivery and assay-value lines.

Zinc-Furnace Shield

A shield for the front of zinc-distillation furnaces, as used by the Société Anonyme G. Dumont & Frères, in



SHIELD FOR ZINC FURNACES

Sclaigneaux, Belgium, is shown in the accompanying engraving. The pivoted slats, which are hollow, have openings in order to permit the circulation of air through them.

Safety Rules—Hooks, Ropes, Blocks*

(1) All crane chains and hooks should be examined frequently, and annealed as often as necessary according to working conditions.

(2) Cables of suitable strength and flexibility shall be provided. All cables should be frequently inspected and replaced at stated periods or whenever necessary.

*From Inland Steel Co.'s book of rules.

(3) Chains and rings should be made of double-refined standard wrought iron. The same iron should be used in replacing broken links. All chains on rings should be of equal length unless for some special purpose.

(4) Guaranteed, long fiber, manila rope should be used if possible.

MAXIMUM WORKING LOAD FOR TWO DOUBLE BLOCKS AND NEW MANILA ROPE

Size of blocks in in.	5	6	7	8	9	10	12	14	16
Regular or Light Pattern, Wood Shell—									
Safe load in lb....	200	300	500	1000	1500	3000	8000	....	....
Heavy and Thick Mortise, Wood Shell—									
Safe load in lb....	...	...	...	1500	....	5000	10000	20000	30000

Note:—A set of double and triple blocks will hoist considerably more, and a single and double correspondingly less. This should be borne in mind as above estimate is figured close and you should not take any chances.

(5) All crane and chain hooks, other than on cranes handling hot metal, should be made of soft basic open-hearth steel.

(6) Laminated plate hooks, containing several thicknesses of plate riveted together, should, if possible, be provided for all hot-metal cranes.

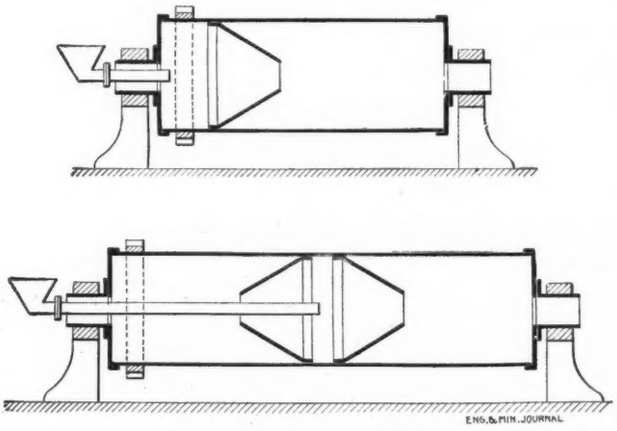
(7) All hooks, where practicable, should be provided with safety handles.

(8) Hooks with the opening between point and shank guarded should be used where there is danger of the load's catching or unhooking.

Safe hoisting strengths for blocks are given in an accompanying table.

Combination Tube Mill

In order to combine the advantages of the ordinary cylindrical tube mill with those of his conical mill, H. W. Hardinge has patented a combination (U. S. pat. No.



COMBINATION TUBE MILL

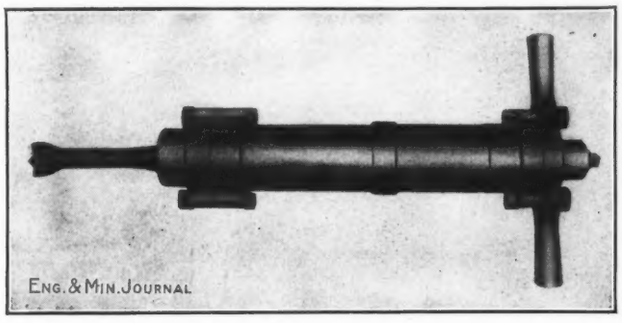
1,041,783) two forms of which are shown in the accompanying drawing. The first form shows a single cone into which the mill feed first enters, the idea being that only the finer pieces will get out for grinding in the cylinder, which is the most efficient sliming apparatus. The second form shows a double cone in the middle of a long cylinder, and is less practical on account of the feed pipe leading into the cone and the inconvenience of discharging from the feed end of the contrivance.

For Fighting Underground Fires at the Mt. Morgan mine in Queensland, the air mains underground have been connected with a water reservoir on the surface, it is stated in the annual report, so that in the case of an outbreak of fire a large supply of water would be available immediately in every one of the stopes. Hydrants and hoses will be placed on the various levels.

MINING AND METALLURGICAL MACHINERY

Hardsocg Automatically Rotating Plugger

The accompanying illustration shows a new machine put out by the Hardsocg Wonder Drill Co., of Ottumwa, Iowa. It is designed to drill down holes, as in sinking, etc. Hollow hexagon steel with a collared shank and a



HARDSOCG ROTATING PLUGGER

six-point bit is used, the steel being automatically rotated by the mechanism of the drill. The advantages of this are well known and obvious. The air-hose attachment is in the thick portion shown in the middle of the cylinder. The machine is built in two sizes; one weighing 40 lb. has a 1⅞-in. piston and uses ⅞-in. steel; the other, weighing 50 lb., has a 2⅛-in. piston and uses 1-in. steel. In its operating principles, the drill follows the well known Hardsocg system.

A New Centrifugal Pump

A new pump, operating on the centrifugal principle, but embodying new features has been placed on the market. It is said to give a high efficiency under varying loads when new, and to maintain this efficiency in service. The construction is such that wear is greatly reduced.

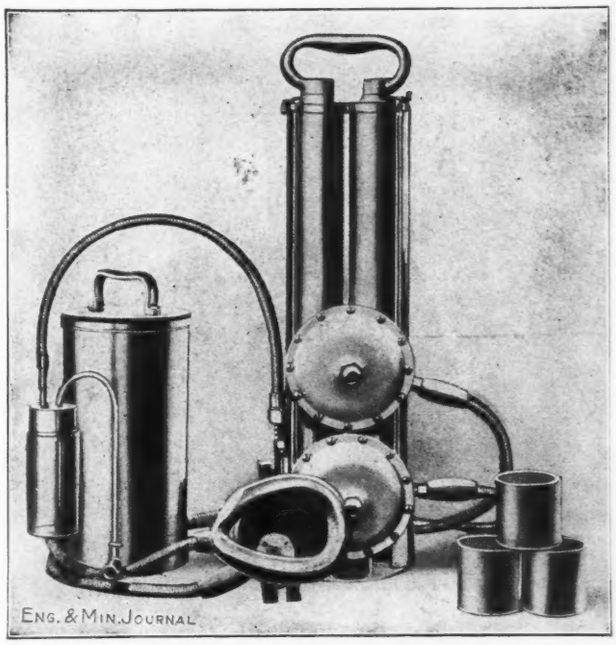
The pump combines the centrifugal-pump principle with the principle of the reaction turbine. The rotor contains an impeller of the closed type with vanes shaped as in the usual centrifugal-pump runner. Around the impeller, but forming part of the rotor, is an annular chamber, the outside of which is closed by a ring, having openings, or nozzles. It is these nozzles which give the turbine effect. Thus the impeller, pressure-chamber and turbine rotate together as one piece. The impeller discharges into the chamber where the water is held at about constant pressure without friction, centrifugal force maintaining the pressure. The water leaving the pressure chamber passes through the rim portion, which is designed similarly to a reaction turbine. The whole, then, presents the combination of a centrifugal pump discharging with a constant pressure and a turbine discharging from a constant pressure, ideal conditions in each case.

The advantages claimed for the type are that a change of head does not make a large difference in efficiency; that the water in the pressure chamber is practically stationary, as regards the chamber itself, thus reducing friction and wear; and that it is self-regulating. Furthermore, since the wear of the important parts is small, the shape of these is not changed and the pump does not become less efficient as it is used.

The pump has been developed by the Rees Roturbo Manufacturing Co., of Wolverhampton, England. In the United States the Manistee Iron Works Co., Manistee, Mich., controls the manufacturing and selling rights.

The Lungmotor Artificial Respirator

The device herewith illustrated is intended for use in resuscitating people apparently dead from suffocation and in other cases where artificial respiration is necessary. It differs from other devices on the market particularly in



PORTABLE ARTIFICIAL RESPIRATOR

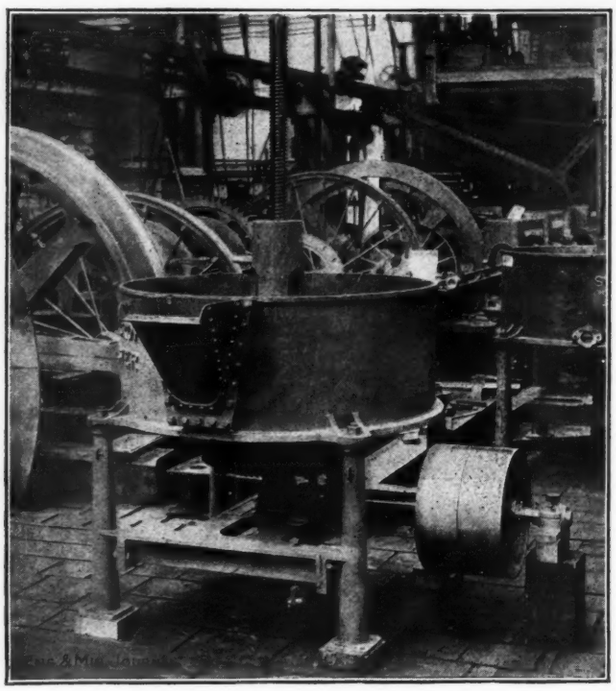
the fact that it is hand operated. It is capable of pumping air alone, or oxygen alone, or a combination of the two in any desired ratio. In operation, one-cylinder pumps in the air-oxygen mixture, and the other exhausts the consumed air from the lungs. The machine is equipped with a pin on the upper part of the right-hand cylinder with which adjustments for different volumes of air can be made, varying the amount from that necessary for a new-born infant to that necessary for a large adult.

For attachment to the patient, either a face mask can be used or a tube which is inserted in the throat. The use of the latter device permits free passage of water from the lungs, in the case of drowning. The advantages claimed for the device are: Ability to vary the propor-

tion of air and oxygen; ability to vary the amount pumped per stroke and the number of strokes per minute; a choice between the face mask and the throat tube; portability, the oxygen being generated by cartridges in the small device shown; ability to supply the tidal volume of air, that is, the amount of air normally displaced with a single respiration, about 35 cu.in., whereas, with other devices the vital capacity of the lungs, about 230 cu.in. per inspiration, must be supplied. The complete outfit weighs a little over 30 lb., and is listed at $125 f.o.b., Chicago. It is manufactured by the Life Saving Devices Co., 1330 Chamber of Commerce, Chicago, Ill.

A New Grinding Pan

As an illustration of recent practice in grinding equipment the figure showing a grinding pan which has recently been constructed by Messrs. Sandycroft, Ltd., of Chester, for the Broomassie mine may be of interest. This pan is made of cast iron and is 3 ft. in diameter. The central vertical driving shaft is driven by bevel gearing from the countershaft, the muller plate being provided with cast-iron shoes working on cast-iron dies fixed to the bottom of the pan. The pan itself is lined with mild

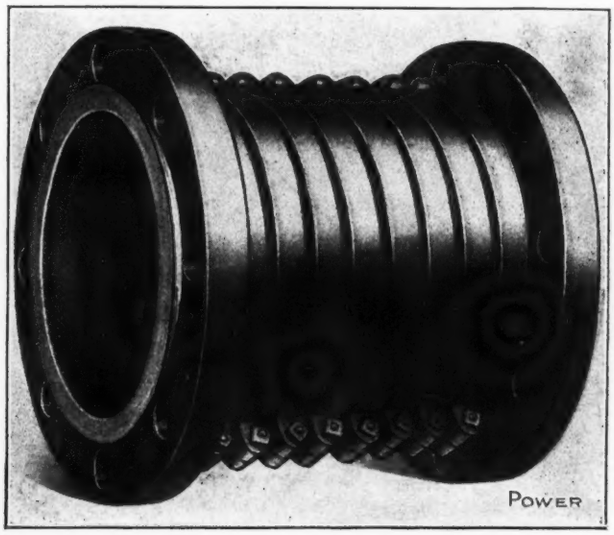


New Form of Grinding Pan

steel protecting plates 3/8 in. thick, while the shoes, dies and protecting plates are renewable. The vertical position of the shoes can be adjusted by means of a hand-wheel and screw on the top of the central shaft. The spitzkasten is arranged with a lip to allow a copper amalgamating plate to be fixed over its full width. The vertical spindle is supported in a foot-step bearing of gun-metal with a hardened-steel toe piece. The countershaft runs at 96 r.p.m. and the bevel gearing has a ratio of two to one. The pan is supported on cast-iron pillars and can be fitted to a timber foundation. The drive may be from below if required.

The Badger Corrugated Expansion Joint

As a substitute for the slip joint, usually leaky and always hard to pack, or for the awkward long-sweeps and loops, a compact corrugated expansion joint has been devised. It is made of copper, and in order to distribute the movement and strain over more than one corrugation, the external rings shown in the illustration are applied. They transmit the movement from one corrugation to the next and thus guard against overstrain. For low



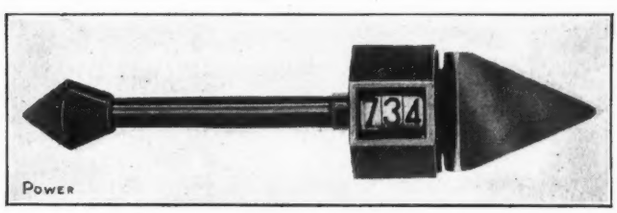
Ring and Corrugation Expansion Joint

pressures, only two or three corrugations in a joint are necessary. For high pressures and superheated steam, more corrugations in a joint are required. The rings also increase the strength of the joint, and in the case of exhaust pipes, stiffen them against collapse.

The joint is made by E. B. Badger, Sons & Co., 63 Pitts St., Boston. A complete line drilled to A. S. M. E. standards is made for all pressures, both high and extra heavy. The diameter of the joints is the same as that of a pipe, and they are made in oval, rectangular, circular and special forms.

Vest-Pocket Revolution Counter

The handy little speed counter illustrated herewith, is suitable for carrying in a vest pocket. The counter reads right or left. One end is made with an arrow point for cleaning out the countersunk shaft end of any accumula-



Handy Counter for Shaft Revolutions

tion of dirt or oil. The counter is made by the American Steam Gauge and Valve Manufacturing Co., Camden St., Boston, Mass.

American Institute of Mining Engineers

SYNOPSIS—Special correspondence covering the meeting of the Institute day by day.

The fall meeting of the Iron & Steel Section of the Institute began at the Engineering Building in New York on Thursday, Oct. 16. In the absence of Charles Kirchoff, chairman of the Iron & Steel Committee, who was unfortunately detained by illness, Prof. J. W. Richards presided at all the sessions but the closing one. The meeting was called to order at 10 a.m. and after a few brief preliminaries, proceeded at once to business, as a number of important papers were waiting to be read. Nearly all of the papers had been published in advance, so that they were read only in abstract and the discussions proceeded promptly; in some cases written discussions being submitted.

The first paper read was by W. A. Forbes on "Blast Furnace Gas Cleaning," describing the process of cleaning blast-furnace gas and preparing it for use in gas engines. This paper was interesting but called out only a brief discussion. It was followed by a paper on the "Slagging Producer," by W. H. Blauvelt, which described the type of gas producer in which the ashes are fluxed and run off as slag. This was one of the earliest types made, but has not been very widely adopted, as it is not suited to many types of coal, although it is an ideal apparatus for gasifying coals having a fusible ash and also for many clinkering coals. A short discussion followed the reading of this paper, and some interesting data were promised as to comparative performance of producers.

The third and fourth papers were taken together, being on almost identical subjects. One was by Prof. F. Peter, of Leoben, Austria, on the "Generation of Steam by Waste Heat from Furnaces," while the other was on the same subject by G. C. Stone. Professor Peter's paper went at great length into the quantity of heat available for this purpose and the necessity of using it if any degree of economy in manufacture is to be attained. He referred to various uses which might be made of the waste heat, as in heating air for blast, superheating steam, etc., reaching the conclusion that its application to raising steam was the most economical method. He also treated of the various forms of boiler which were best adapted for the utilization of the waste heat, describing several which had been used in practice, and commenting upon their strong and weak points. Mr. Stone brought forward a number of instances in which waste heat from metallurgical furnaces had been used for raising steam, in some cases with a carefully prepared installation and in others, with such material and appliances as happened to be at hand. His conclusions coincided very nearly with those of Professor Peter. A long debate followed the presentation of these papers, in which many interesting notes of experience were brought forward by different members. The general conclusion was that the application of waste heat to the raising of steam was desirable, and that the simplest forms of apparatus possible were the best.

The morning session concluded with a paper by W. R. Shimer on the "Over-Oxidation of Steel," in which he briefly called attention to the troubles arising from this source in the manufacture of steel on a large scale.

The Afternoon Session

After lunch the session was resumed. A group of three papers on the "Use of Powdered Coal as Fuel" was presented by Dr. Richard K. Meade, Prof. H. R. Barnhurst and W. S. Quigley. These three were supplemented by a note from G. W. Shinn. Doctor Meade's paper treated very thoroughly of the mechanism and methods of different kinds used in preparing powdered coal for use in the furnace, and the conditions under which it could best be employed. Professor Barnhurst and Mr. Quigley spoke of the different kinds of coal best adapted for use in this form, and Mr. Shinn gave a very interesting account of experience with powdered fuel at the Lebanon and Reading steel plants. The use of powdered coal, which has been general in cement furnaces, presents many points justifying its adoption in reverberatory and other furnaces. The coal best adapted for use in this form is a long-flamed coal, Pennsylvania gas coal being well suited for this purpose. The main point of difficulty in metallurgical furnaces is the disposition of the ash, which, of course, is easily made in the cement furnace. A long and interesting debate, bringing out various experiences with powdered coal, followed the reading of these papers, many members taking part in the debate.

Two papers on "Briquetting" followed, one by E. Stuetz, describing the "Scoria Process" for the manufacture of briquettes from fine ore and flue dust, also slag brick for building purposes, the binding material being granulated slag. The other paper, by Felix A. Vogel, described the "Schumacher Process" of making briquettes from similar material. The discussion of these papers rather degenerated into an argument on their respective merits, and was cut short to give way to the final paper of the day, an interesting one by Richard H. Lee, on the "Use of Nodulized Ore in the Blast Furnace." This paper referred to the relative quantities of fuel required in smelting different ores, the preferable qualities of coke and a number of other points, and noted the advantages obtained by the use of a nodulized ore. Some experiences were given of a furnace owned by the Pennsylvania Steel Co., at Lebanon, running exclusively on nodulized Cornwall magnetite. It had been shown there that there was no difficulty of running on this material exclusively with a hard and regular coke. A brief discussion followed this paper.

The Second Morning Session

The morning session on the second day was occupied largely by a group of papers of very technical character. These included three papers by Prof. H. M. Howe, on "Determination of the Position of Ae_3 in Carbon-Iron Alloys"; "Discussion of the Existing Data as to the Position of Ae_3"; and on "Ae_1, The Equilibrium Temperature for A_1 in Carbon Steel." In these papers, Professor Howe gave a lucid discussion of his recent experiments in the heat treatment of steel, and illustrated them by a number of diagrams and sections. These papers were discussed by Professors Stanchfield, Richards and others, and a long letter from Professor Le Chatelier was read by way of a written discussion. Incidentally the wish was expressed by some of the speakers that a method

might be found of applying Professor Howe's tests and experiments more directly in the critical treatment of large quantities of steel. Two papers of much interest and of similar character followed, one by G. K. Burgess and J. J. Crowe, on the "Critical Ranges A_2 and A_3 of Pure Iron," and another by the same authors on the "Thermal and Microscopical Examination of Professor Howe's Standard Commercial Steels." These papers, like Professor Howe's, cannot be well summarized on account of their extremely technical character. In the discussion, incidentally, a description was given of some apparatus for the determination of alloy steels by spectrum annalysis, which presented a very interesting method.

The Closing Session

At the afternoon session on Friday, Dr. R. W. Raymond presided and referred to the long series of iron and steel investigations conducted under the auspices of the Institute and beginning with the epoch-making investigations of the late Doctor Dudley on rail steel and of W. S. Metcalfe on the composition of steel.

The first paper of the afternoon was by R. R. Abbott, on "The Influence of Various Elements on the Absorption of Carbon by Steel," which brought out a brief discussion. A paper by J. H. Hall on "Shock Tests of Cast steel" was discussed at considerable length, many members taking part in the discussion, including Messrs. Chancelor, Knox, Webster, Johnson, Campbell and others. Some curious instances of the failure of steel castings under shock after successfully passing other tests, were brought forward.

The most important paper of the afternoon was a description of a large number of tests on "The Influence of Copper on the Physical Properties of Steel," by G. H. Clevenger and B. Ray. This treated at length on a subject which has attracted a great deal of attention lately, and about which many rather loose statements have found currency. A short debate followed, the chief point brought forward being that the Pennsylvania Steel Co. had experimented on a large scale in the use of copper in steel as a preventive of corrosion, without attaining any encouraging results.

The paper contains many tables giving results and can best be summarized by the conclusions which follow:

1. In making copper steel by the crucible process it is necessary to "kill" the metal before adding the copper, and just before pouring it is advisable to add a small amount of some deoxidizing agent.

2. In forging the ingots, containing from 0.437 to 0.065% of carbon, traces of "red-shortness" began to be shown with a copper content of 4.512%. Up to this point the steel forged about like machine steel.

3. Up to 0.846% of copper our steels gave satisfactory welds. At 1.857% the weld was much weaker, and above this point the steel could not be welded.

4. There appears to be a marked tendency for copper to eliminate sulphur.

5. In the series of steels studied the segregation of copper toward the bottom of the ingot begins to be slightly noticeable with 0.846% of copper. With 2.773% of copper the segregation is more noticeable, and with 4.512% of copper it is very marked.

6. The presence of small percentages of copper up to 0.493% has a most marked effect in preventing the corrosion of steel by dilute sulphuric acid. As the percentage of copper increases, the loss by corrosion increases until with 2.773% of copper the loss is greater than when the steel does not contain copper.

7. As the percentage of copper increases the structure becomes finer, due to the more even distribution of fibrous cementite. This is more apparent in the forged than in the annealed specimens.

8. The point Ar_1 was lowered from 730 deg. C. in the steel containing no copper to 635 deg. C. in the steel containing 4.512% of copper.

9. The elastic limit in both the annealed and the unannealed specimens increases steadily until with 4.512% of copper it was increased more than 100% over that of steel containing no copper.

Within the limits investigated the ultimate strength appears to increase almost in direct proportion to the amount of copper present.

With the unannealed specimens the actual breaking strength in all cases was the same as the ultimate strength. The actual breaking strength in the case of the annealed specimens shows an increase with the increase of copper.

In the annealed specimens the elongation is somewhat irregular, but in general decreases up to 1.857% of copper and then increases and reaches a maximum at 4.512% of copper.

The general tendency in the annealed specimens is to decrease the elongation up to 1.85% of copper and then up to 4.512% of copper to gradually increase it. In the unannealed specimens the general tendency is to decrease the elongation throughout the series.

10. The hardness of the steel increases with increasing copper content and corresponds fairly well with the tensile tests.

W. E. Ruder presented a paper, illustrated with sections and diagrams, on "Grain Growth in Silicon Steel," and short papers were read by J. H. Hall on "The Life of Crucible Steel Furnaces," and by H. F. Miller, Jr., on "A New Design of Regenerators for Openhearth Furnaces." Two papers were laid over for want of time, one by C. P. Linville, on "A Chart for Use in Connection with Wet and Dry Bulb Thermometers in Making Psychrometric Determinations," and the other one on "The Future of the Chilled Car Wheel," by P. H. Griffin. Both of these papers were published in the "Transactions" in advance of the meeting.

The meeting was notable for the large attendance, the close attention paid to the papers, notwithstanding the rather severely technically character of some of them, and the general participation in the discussions.

It concluded with dinner at the Engineers' Club on Friday evening, Oct. 17, at which over a hundred members and guests were present, and which was much enjoyed.

A Blast Furnace for New York

Rumors have been persistently current for some weeks to the effect that strong interests were about to establish a blast furnace plant somewhere close to New York, and to this end were obtaining control of many of the iron mines along the Hudson and at other points in the vicinity.

It is now reported by the *Iron Trade Review* that interests including Witherbee, Sherman & Co. are to erect two 400-ton stacks at Boynton, N. J., on Arthur Kill, opposite Staten Island. It is stated that the expectation of a general stimulus to trade following the opening of the Panama Canal, is the fact that the forthcoming opening of the barge canal from Buffalo to the Hudson and the enlargement of the canal from Lake Champlain to the Hudson, will permit cheap delivery in New York of Lake Superior and Lake Champlain ores, together with the existence of a market in the immediate vicinity of New York capable of absorbing a large tonnage of pig iron annually, are the considerations which have led to the decision to build the plant. This report seems well substantiated.

It is also stated that other interests associated with the estate of the late Anthony N. Brady contemplate the con-

struction of a furnace in the same general locality, and also a railroad to give communication to Port Morris, involving a bridge across the Hudson. The authenticity of this rather elaborate program cannot be determined.

Progress in the Kennedy Extension-Argonaut Suit

The Kennedy Extension-Argonaut apex suit, on trial before Judge F. V. Wood, in the Superior Court of Amador County, closed for the plaintiff on Sept. 29, with the evidence of Mr. Devereaux, manager of the Melones mines, as to the junction of veins in the Kennedy Extension ground, and documentary evidence by Mr. Perry, of counsel for the Kennedy Extension, of ore extracted and milled from the disputed ground since Jan. 1, 1913. Judge Curtis H. Lindley opened the case for the defendant with a concise statement, showing the situation of the Pioneer claim owned and mined by the Argonaut, and of the Jackson claim, owned and mined by the Kennedy Extension. These claims cover the chief ground in dispute.

Judge Lindley recited records showing the priority of the Pioneer over the Jackson location, but maintained that the question of priority is not one of consequence in the suit, because the defendant company does not believe nor admit that there is any such vein as the Jackson vein involved in the controversy. It is the contention of defendant that the Jackson vein claimed by plaintiff does not exist; that it is merely a constructive theory and entitled to no consideration as a vein as affecting the orebodies in dispute; that the plaintiff has not established anything like what the law requires as the apex of such a vein; and that, if it could be contended that the Jackson vein had a potential existence, there is no showing either on the strike or dip of any Argonaut vein joining another vein in the Jackson ground. It is contended by the defendant that the only joining or junction of veins is entirely in Argonaut ground north of the end line of the Jackson claim extended.

R. S. Rainsford, manager of the Argonaut Mining Co., identified and explained the maps and models of the defendant and described the mining geology and physical features of the Argonaut, including the Pioneer and other mining claims embraced in the disputed ground. Besides a general map there are two models, and two other diagrammatic maps illustrating one of the models. One model is of structural character constructed of sectional copper rods representing the Argonaut shaft and the drifts and crosscuts down to the lowest level, an incline depth of 3900 ft. This model is held in a wire frame, rests on a white-print base plat, and stands on a wooden base. The other model is constructed of nine separate glass sheets set edgewise in a wooden frame, illustrating the shaft, the formation and the orebodies mined, in colors. This model also rests on a white-print base plat. Both models are built on a scale of 80 ft. to 1 in.

Mr. Rainsford will be followed by Professor Lawson, of the University of California, Prof. W. H. Wiley, of Los Angeles, and Frederick Searles, of Nevada City. The expert testimony offered on behalf of the plaintiff respecting the geologic and physical features of the mine was by John W. Finch, Professor George, state mineralogist of Colorado, F. I. Martin, superintendent of the Utica mines, at Angels Camp, and William Devereaux, manager of the Melones mine.

The contention of plaintiff is that the Argonaut has no vein apexing within the surface of its claims beyond the flat vein near the surface that underlies a lava cap; that the deeper portions of the Argonaut vein form the Jackson vein which it is claimed has its apex within the boundaries of the claims owned by the Kennedy Extension.

American Mining Congress

Members of the American Mining Congress opened their annual convention in the Bellevue-Stratford Hotel, in Philadelphia, on Oct. 20. Appeals were made for the enactment of workmen's compensation laws in every state and for the conservation of the coal deposits.

David W. Brunton, of Denver, Colo., retiring president of the congress, arraigned at the reception on the opening evening what he declared to be a gigantic smelting monopoly that has the miners of the West by the throat:

> Years ago there was ample competition among the numerous smelting companies, and the miner could be sure of obtaining all that his ore was worth.
>
> Today most of the plants have passed into the hands of a few great corporations, which practically amount to a gigantic monopoly, which not only tell the miner what they will pay for his ores, but in some instances just how much ore they will permit him to produce.

The crying need of the mining industry, according to Mr. Brunton, is a complete revision of the present mining laws.

On Oct. 21, the industrial display proved a strong drawing card. Thousands of visitors spent the afternoon or evening in Horticultural Hall, the chief interest centering around the model mine in the basement.

There was no afternoon session of the congress, the delegates enjoying a trip of inspection on the Delaware River, but in the evening a number of addresses were delivered. Chief among these was a paper upon "Mine-Rescue and First-Aid Operations," read by J. W. Paul, of Pittsburgh, Penn.

In an address upon "The Use and Abuse of Explosives," Robert W. Gunnell, of Pottsville, Penn., declared that one of the great necessities for the preservation of life was to teach the miners to use care and brain work in the planting of charges and to realize that the strongest explosive was not always the best.

E. C. Sargeant, of Chicago, spoke upon "The Use of Concrete in Mining Operations," while Dr. W. R. Crane, of State College, delivered an illustrated address, in which he pointed out the vast coal resources of Alaska. While drawing attention to the labor required to make mining a success in the northern territory, he added that in time this country would have to turn to that district for its coal.

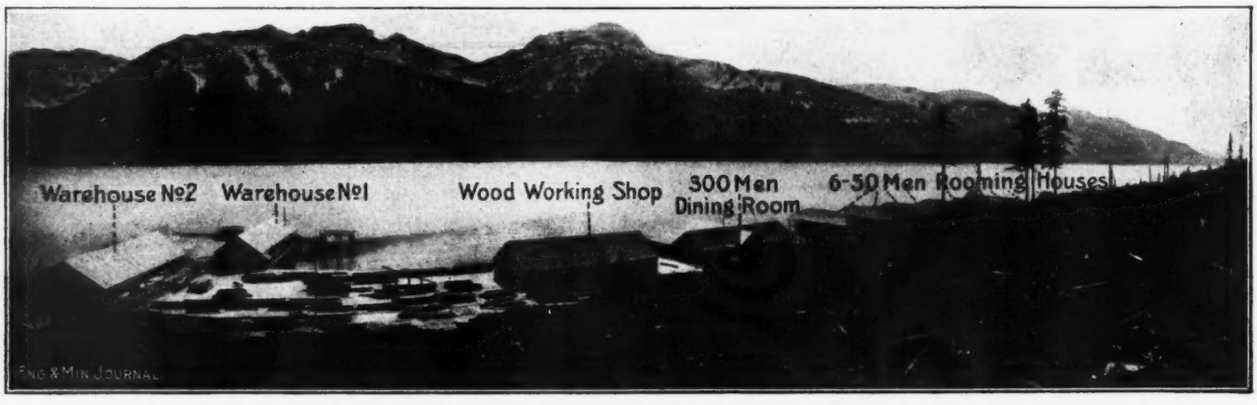
The chief subject of the morning session in the Bellevue was "Taxation of Mining Property." Addresses were delivered by R. V. Morris, Wilkes-Barre; Dr. H. M. Chance, Philadelphia; D. L. Webb, Denver; J. B. L. Hornblower, Pittsburgh, and S. A. Taylor, Pittsburgh.

Utah's Production of Gold and Silver in 1912 as shown by figures of the Mint was gold, valued at $4,312,600, and fine silver 13,076,700 oz. The production of silver shows a marked increase over 1911, and gives Utah second place among the states in the production of this metal, being exceeded only by Nevada.

PHOTOGRAPHS FROM THE FIELD

VIEW FROM GASTINEAU CHANNEL OF ALASKA GASTINEAU MILLSITE, THREE MILES EAST OF JUNEAU

A, wharf; B, warehouses; C, incline tramway to Sheep Creek tunnel; D, boarding house; E, rooming houses; F, clearing for millsite, on which will be built a mill of an initial capacity of 6000 tons of ore per day.



GENERAL VIEW OF GASTINEAU CHANNEL AND ALASKA GASTINEAU BUILDINGS FROM MILLSITE

The point from which this view is obtained is marked C, in the view above.

EXPERIMENTAL MILL OF THE ALASKA GASTINEAU MINING CO., AT SHEEP CREEK

Here tests are being made to determine the practice in what will be the largest gold mill in the world.

ROADS BETWEEN JUNEAU AND THE PERSEVERANCE MINE

This road is to be used for hauling all supplies and materials during construction and development periods. At many places the surface of the road is supported by timber as shown in this view.

The Gold Creek road. Auto trucks, horses, railroads, incline tramways and water haulage solve the transportation problem.

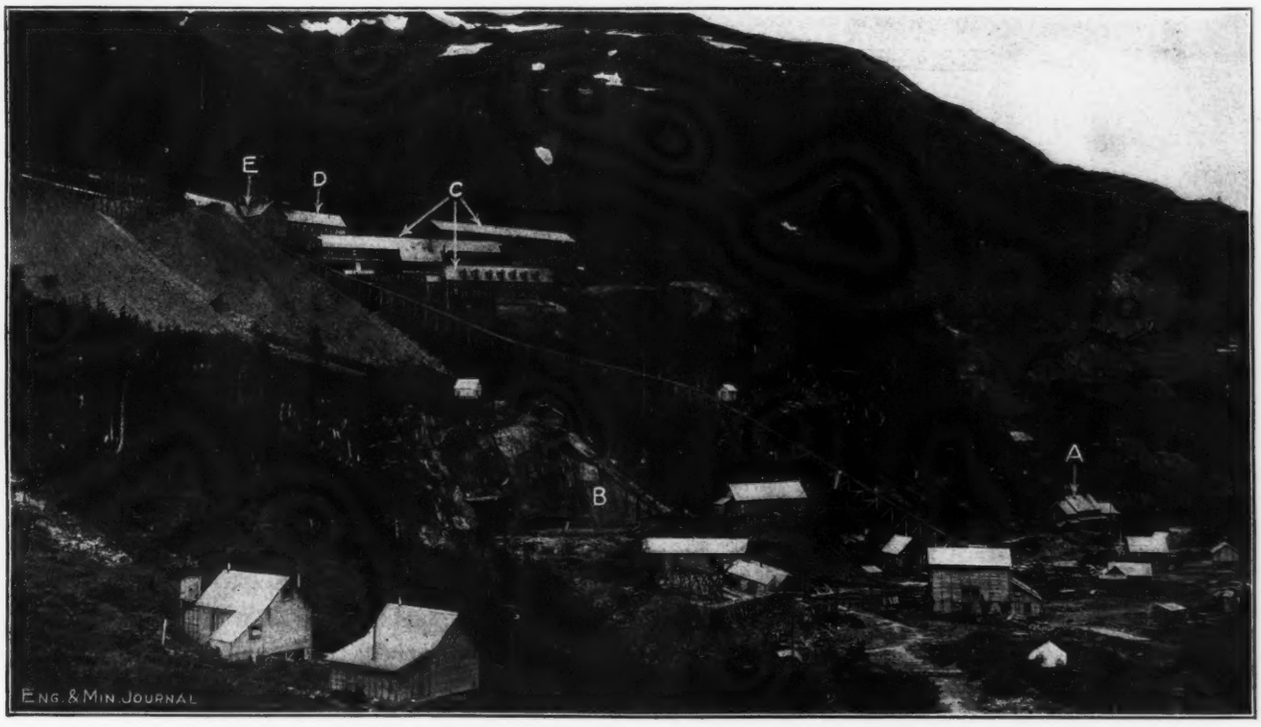
PORTAL OF SHEEP CREEK TUNNEL

The view is looking down Sheep Creek basin.

HEAD OF GOLD CREEK CANYON

The buildings are at the Perseverance mine.

A narrow-gage railroad connects the millsite with the Sheep Creek tunnel, which is being driven to become the main outlet for the mine. Besides the Perseverance and Hog and other claims totaling 1200 acres, and a maximum Sheep Creek, the company owns the Silver Bow Basin, Ground length of more than two miles on the Gold Creek lode system.



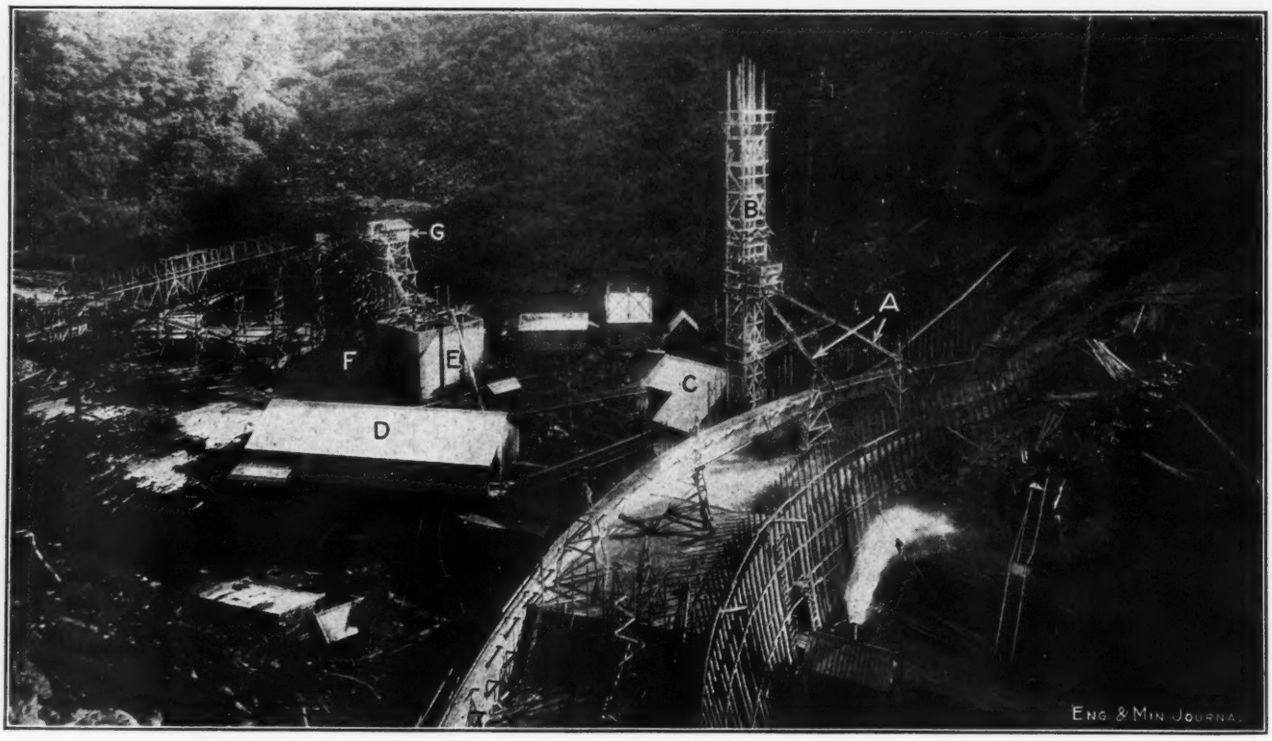
STRUCTURES AT THE PERSEVERANCE MINE OF THE ALASKA GASTINEAU MINING CO.

A, staff house; B, site for new compressors; C, rooming and boarding houses; D, shops; E, portal of Alexander crosscut.

PERSEVERANCE MINE BUILDINGS OF THE ALASKA GASTINEAU MINING CO.

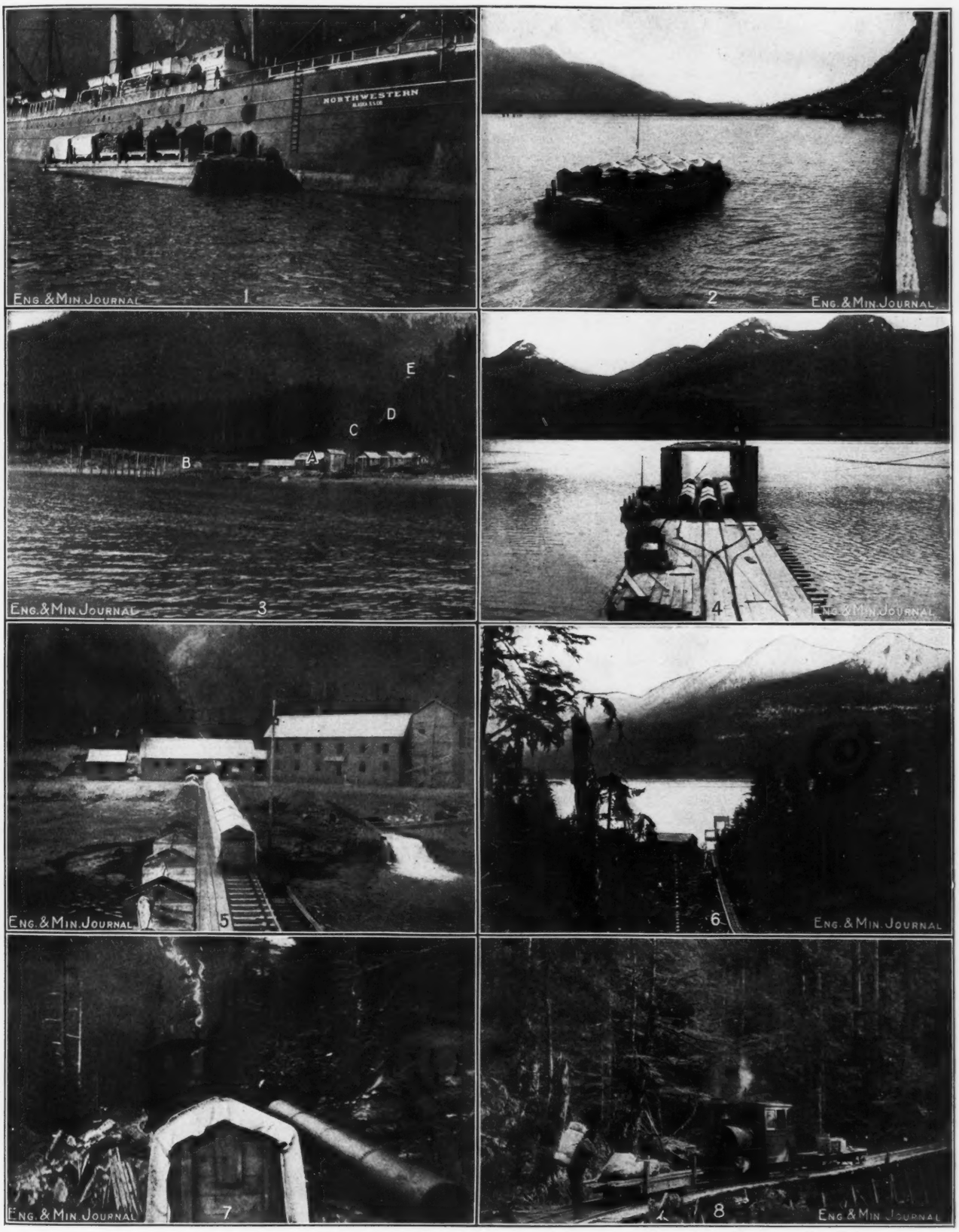
A, rooming house; B, rooming house; C, boarding house for 500 men; D, shops; E, portal of Alexander crosscut.

A 500-ton mill was operated on this claim prior to the acquisition of the Alaska Gastineau properties by the Alaska Gold Mines Co., the present holding company, of the Alaska Gastineau Mining Co., but because of shortage of water, it could be operated only a few months in summer. Up to the end of 1911 it had treated 300,000 tons of Perseverance ore. The Sheep Creek tunnel, 700 ft. deeper than the Alexander crosscut, is being driven parallel to and mostly in the Perseverance vein. A still deeper tunnel may be driven later.



SALMON CREEK DAM, WHERE WATER FOR THE DEVELOPMENT OF 6000 HP. WILL BE STORED

A, spouts for distributing concrete; B, two-compartment hoisting tower for concrete; C, mixing plant; D, cement warehouse; E, sand bin; F, storage pile of washed gravel; G, screening and washing plant. Cement for the dam is transported four miles by water, three miles by railroad, and is raised to an elevation of 1200 ft. at the damsite, without being removed from the cement cars, as shown in the views on the opposite page.



TRANSPORTING CEMENT FROM STEAMER SEVEN MILES TO SALMON CREEK DAM

1, cars of cement being lowered from steamer to scow; 2, scow en route to Salmon Creek landing; 3, general view at landing, A, power house, B, scow landing, C, incline tramway, D, pipe line 1700 ft. long, 36 in. diameter to power house on Gastineau Channel, E, forebay; 4, transferring cars from scow to incline tramway; 5, cars at beach yard; 6, incline tramway, scow landing and pipe line; 7, cement cars on railroad; 8, construction railroad up Salmon Creek.

Developments in Sudbury Nickel Properties

The keen demand for nickel during the last nine or ten months has had a marked effect upon the development of nickel-copper properties in the Sudbury district in Canada. The old Murray mine was optioned by the Dominion Nickel Co., about 10 months ago, was drilled, and a considerable body of ore proved. The company sold it to the Canadian Nickel Corporation along with its other holdings in the district, amounting to several thousand acres on the nickel belt; the price for the entire group amounted to several millions of dollars. Drilling operations were continued by the new owners, with the result that now the Murray mine has between 10,000,000 and 11,000,000 tons of first-class ore.

The new company, with Dr. F. S. Pearson at its head, has mapped out an extensive development policy, a smelter and refinery is to be erected three miles west of Sudbury. Extensive preparations have already been made and considerable work has been done on the foundation of this new plant. This will, if erected, be the first refinery for nickel-copper ore in the Dominion of Canada and will mean much to Sudbury and the whole nickel industry.

The Mond Nickel Co. blew in its new smelter last June. It has been running smoothly ever since. This company has secured options on several valuable tracts of nickel land and has been doing extensive diamond drilling. At present eight diamond drills are running on what is known as the Levack group and three more are being put in commission. It is reported on reliable authority that an extensive body of rich ore has been blocked out on what is known as No. 1 property; the owners have already received two payments on the purchase price.

CIVIL SERVICE EXAMINATIONS

The Civil Service Commission announces an examination on Nov. 10, for assistant metallurgist, to fill a vacancy in the Bureau of Mines, at from $2000 to $3000 per year. The duties of the position will be to investigate smeltery fumes and other metallurgical problems in smelter operations. Competitors will be rated on: (1) General education and technical training, 40; (2) professional experience and fitness, 40; (3) publications or reports, 20. An educational training equivalent to that required for graduation from a college or university of recognized standing, including courses in chemistry, physics, metallurgy and mineralogy; and not less than three years' experience in chemical and metallurgical work in smelting, or not less than one and one-half years at such chemical and metallurgical work and one and one-half years' experience in metal-mining operations, are requisite. Under (3) the applicant must have demonstrated ability to prepare reports as shown in manuscript reports or published papers. Applicants must have reached their twenty-fifth but not their fortieth birthday. Persons who meet the requirements and desire this examination should apply for Form 304, Metallurgist (male), No. 1086.

The Civil Service Commission announces an examination, on Nov. 10, for metallurgical engineer, for work in iron blast-furnace operations, to fill a vacancy in the Bureau of Mines, at from $2500 to $4000 per year, to investigate safety and efficiency problems in iron blast-furnace operations. Competitors will be rated on: (1) General education and technical training, 40; (2) professional experience and fitness, 40; (3) publications or reports, 20. A training equivalent to that required for graduation from a college or university of recognized standing, including courses in chemistry, physics and metallurgy, and not less than four years' experience in the operation of the blast furnace, are requisite. Under (3) the applicant must have demonstrated ability to prepare reports as shown in manuscript reports or in published papers. Applicants must have reached their twenty-fifth but not their fortieth birthday. Persons who meet the requirements and desire this examination should apply for Form 304, Metallurgical Engineer (male), for work in iron blast-furnace oprations, No. 1087.

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The Civil Service Commission announces an examination on Nov. 10, for metallurgical engineer, for work in iron and steel, to fill a vacancy in the Bureau of Mines, at from $3000 to $4000 per year, to conduct investigations into safety and efficiency problems in the metallurgy of iron and steel. Competitors will be rated on: (1) General education and technical training, 30; (2) professional experience and fitness, 40; (3) publications or reports, 30. A training equivalent to that required for graduation from a college or university of recognized standing, including courses in chemistry, physics and metallurgy, and not less than six years' experience in the metallurgy and operation of iron and steel mills, are requisite. Under (3) the applicant must have demonstrated a capacity for preparing reports as shown in manuscript reports or published papers. Applicants must have reached their twenty-fifth but not their fortieth birthday. Persons who desire this examination should apply for Form 304, Metallurgical Engineer (male), for work in iron and steel, No. 1088.

❖

The Civil Service Commission announces an examination on Nov. 10, for assistant petroleum chemist, to fill a vacancy in the Bureau of Mines, at from $1800 to $2160 per year, to assist in chemical researches in petroleum, and especially the refining of petroleum or petroleum products. Competitors will be rated on: (1) General education and technical training, 50; (2) professional experience and fitness, 30; (3) publication or reports, 20. An educational training equivalent to that required for graduation from a college or university of recognized standing is requisite. It is desired, if possible, to secure a Ph.D. in chemistry and physics who has had at least one year's experience in chemical and physical researches in petroleum. Under (3) the applicant should have demonstrated ability to record and report observations through manuscript reports or published papers. Applicants must have reached their twenty-fifth but not their thirty-fifth birthday on the date of the examination. Persons who meet the requirements and desire this examination should apply for Form 304, Assistant Petroleum Chemist (male), No. 1089.

EDITORIALS

The Situation in Mexico

The situation in Mexico is now about at its worst. A large part of that country has relapsed into barbarism. Industry has ceased. Mines have been closed for the reason that necessary supplies are no longer obtainable. The fields lie fallow because the *rancheros* cannot afford to plant corn and raise cattle merely to have them taken by marauders. Assassination and murder are done everywhere.

Up to a year ago, the plundering and murdering was limited to the Mexicans themselves. Their own resources having been consumed, there being no more to take in native quarters, attacks on foreigners and foreign property began.

The whole story of the hellish deeds that have been done in Mexico has never been told. The Associated Press does not cover that sparsely settled country and such events as the looting of the city of Durango by the bandit Urbino have passed unchronicled.

We do not believe that the Washington government has heard about things, or has had an accurate conception of conditions. The attitude of Mr. Bryan toward certain well informed persons, who have made representations to him, has not been encouraging.

The administration may be correct in refusing to recognize Huerta, may have good reasons for that, and by excluding Mexico from money supplies may hasten her reversion to barbarism in the hope that out of anarchy some solution will perforce be found, but there is nothing constructive in this policy.

One of the best summaries of the true condition of the government in Mexico is written by Louis C. Simonds, a member of the staff of the *Mexican Herald,* in the *Atlantic Monthly* for October, who says:

> The truth is that Mexico's greatest misfortune is that she adopted a constitution unsuited to her needs and to the genius and character of her people. The instrument in question dates from the year 1857, when feeling ran high between Clericals and Liberals. The latter, having for the time the upper hand, and admiring the greatness of the United States, but lacking a philosophical insight into the causes of that greatness, patterned the new Mexican Constitution very largely on the constitution of the United States, overlooking the fact that the Mexican people, of whom 80% are still illiterate, could not be expected to make an intelligent use of a political system devised for the most advanced and enlightened of modern democracies.
>
> General Porfirio Diaz undoubtedly realized the inadaptability to Mexico's needs of the constitution of 1857. But not even he, with all the immense authority which he at one time wielded, ever ventured to propose a radical reform of that constitution, so as to do away with the Federal system and establish in its stead a strong centralized government, with a restricted suffrage. And he did not venture on this step, because he knew that to the Liberals of Mexico the constitution of 1857 has ever been a fetish, and that to attempt to modify it radically, even though avowedly it remained largely a dead letter, would be to precipitate a civil war.
>
> De facto, General Diaz did establish a strong centralized government, and, as for popular suffrage, he practically nullified it. But where the facts and theories of government are in chronic conflict, there can be no enduring political peace. A clamor will be raised from time to time for the strict enforcement of the constitution, and reproaches will be launched against the government for its nonobservance. Such, in effect, was the outcry that gave force to the movement headed by Senor Madero.

Something will have been gained when the President of the United States ceases to talk about having a fair election in Mexico. There never was one. It will be many years before there will be one. Huerta may be impossible, but the restoration of order in Mexico will come only through the exercise of a strong, ruthless hand, and if such appears in any quarter, Washington will do well to help it, irrespective of any form of election. Press dispatches from Washington indicate that something of this kind is seeping into the minds of the Administration. It is said that there is some reason to believe that the sympathies and also the hopes of the Administration now lie with the "constitutionalists" controlling several of the northern and middle states, and the notion is beginning to prevail that the Administration would welcome some action by the revolutionists, which would give a new turn to the present unsatisfactory situation. This is construed as meaning that the overthrow of the Huerta government by violence and the triumph of the rebel leaders would be regarded as a solution which the United States might be able to accept.

Meetings of Societies

Not long ago, we called attention to the constantly recurring conflicts in the dates of meetings of technical societies, rendering it impossible to secure the attendance at any one of them that the officers would like. We suggested a clearing house to obviate such conflicts. Our suggestion has excited a good deal of approving comment. It is now proposed to arrange some sort of a clearing house, or better, we might say some sort of a "block signal service," in the United Engineering Building in New York.

During the present month there has been such an epidemic of collisions among the several societies that a stranger might think that the managers of the New Haven R.R. were running things. In New York last week there were meetings of the American Institute of Mining Engineers and of the American Electrochemical Society. The New York Section of the Mining and Metallurgical Society waived its regular date in order to avoid there being three technical meetings on the same day, and in the same city, and postponed its meeting a week, but was unable to avoid collision with the American Mining Congress.

Quotations for Copper

A disingenuous contemporary in Chicago remarked in a recent issue:

> The U. S. Geological Survey has issued its annual general report on the copper industry of the United States for 1912 as an advance chapter from "Mineral Resources." Probably the most important feature of this report to a majority of the copper producers is the average monthly prices given for copper. These figures, in comparison with the prices estab-

lished by the "Engineering and Mining Journal," and on which the American Smelting & Refining Co., the so called smelter trust, claims to settle, are from ⅛c. to ¼c. a pound more. The query that naturally arises is why is it that the U. S. Geological Survey, with its great staff of experts and statisticians, gives out such figures in the face of the considerably lower price as established by the "Journal"? We expect that all figures given us by the Survey shall be authentic, or that they will be omitted.

Our contemporary alleges that it "wants to know" and says it is "high time" the copper producer be "accorded fair play." Of course the *Mining World* knew that the Geological Survey specifically credited its figures to a minor trade paper and that the Geological Survey said with reference to those quotations:

The New York quotations are the basis on which copper is sold by the mines to custom smelters and are used by the United States Geological Survey in calculating the value of both mine and smelter output. It is well known, however, that this average yearly price only approximates the actual average price received for copper sold during the year. The average selling price received by several large producers of electrolytic copper, as given in their annual reports, varies from 15.51c. to 16.58c., with an average of 15.77c., which indicates that the **average as indicated by the quotations was considerably above the actual average price realized by producers."**

If the Chicago paper had had any idea of being honest it would, of course, have quoted the Geological Survey to the above effect. Its failure to do so is *prima facie* evidence of its maliciousness.

As for the Geological Survey, "its great staff of experts and statisticians" clearly does not know what it says, viz., that the quotations adopted by it are "the basis on which copper is sold by the mines to custom smelters," which is not the case; nor has the Geological Survey any particular information about the copper market, anyway. Up to its last report it used the JOURNAL's quotations without credit. Early in this year the Geological Survey charged the JOURNAL with using some of its statistics without giving credit, we retorted *tu quoque,* and there was an acrimonious discussion. The substitution in the last Geological Survey report may have had something to do with this. We don't know.

As to the JOURNAL's quotations for copper, interested persons and contemporaries with axes to grind like to cultivate the idea that they are too low. They are not too low. If anything, they are too high. The fact that poorly informed newspapers give higher prices does not signify anything more than that theirs are much too high. The producers do not realize such prices. Examination of their annual reports shows that they have difficulty in coming up to the JOURNAL's quotational average. Some producers may beat it one year, some another, inasmuch as everybody does not sell at the same price or always to the same advantage, but the sale of the whole copper product of the country does not fetch quite the JOURNAL's quotational average.

The American Smelting & Refining Co., which is referred to by the Chicago paper, sells on commission the copper of the Nevada Consolidated and of the Utah Copper Co. During the last three years those companies have reported as follows:

Year	Utah, pounds	Average	Nevada, pounds	Average	E. & M. J. average
1910.....	84,502,475	12.67	62,772,342	12.75	12.74
1911.....	93,514,419	12.65	*78,541,270	12.50	12.38
1912.....	91,366,377	15.84	63,063,261	15.98	16.34

*Eighteen months.

We do not imagine that the A. S. & R. Co. sells its own purchased copper to any better advantage than it does these large outputs. We are not sure that the prices above reported do not include delivery charges and are correspondingly higher than the New York basis.

In September last, the newspapers had the price of copper at 16⅞c. (which price was merely a priced asked by some producers who were not selling copper, and, anyway, included delivery charges). Our average for that month was 16.328c. An important agency that was selling copper right along realized on all of its sales 0.05c. more in one week, 0.036c. less in another, and came within a small decimal fraction in a third week of the period during which comparison was made.

The mistaken idea about prices for copper higher than our quoted average emanates generally from the fact that the newspapers in New York are in the habit of reporting alleged transactions at the highest possible price, perhaps with the idea of influencing the stock market, perhaps simply out of ignorance; and include in such prices the delivery charges. Anybody who reckoned on realizing such prices on the average sale of his output would simply find that he had been living in a fool's paradise.

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What is the Copper Market?

When the big producers of copper are holding out for a price that they would like to get, and ultimately they may or may not get, they are more or less irritated to see the market fall off on the transactions of dealers, traders, and the class commonly referred to as "second-hands" (although there are generally some first-hands among them). The big producers would naturally like to see the market at what they demand.

The fact that frequently it is not so is a condition, not a theory. There are only two conceivable remedies. One is to organize a pool and cause all the copper to be sold through it. If the monopoly were complete, any desired price might be named and consumers would have to pay it, or go without. However, the laws of the United States do not permit this.

The other remedy is simple and lawful. Persons who would like to see a high price have only to go into the market and buy all the copper that is offered cheaply. The price goes off when there are no buyers, or only a few, and they more or less timid, and attracted only by concessions. Of course, there is danger in this expedient, which M. Secretan discovered, and that no doubt is the reason why it is not more commonly tried.

The natural market in copper, steel, stocks and everything else is the price at which some people are willing to buy and other people are willing to sell. The participation of both parties is necessary. The willingness of one party to sell at a price that the other party is unwilling to give, or *vice versa,* does not make a market in anything wherein there is open trade. Of course, things are different in the case of monopolies.

The recovery in the price this week upon the strength of European buying shows that this time the producers who stood aloof succeeded in carrying their point as we indicated they probably would do in reviewing the situation several weeks ago.

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Practical Effect of Bonus System

The attempt to reduce dredging costs by the institution of a bonus system, described in this issue by Dr. H.

M. Payne, represents an application to mining of one of the principles of scientific management. The results of the bonus and of the competition between the various dredges are rather remarkable. There are possibilities here which are generally overlooked in mining. A reduction of costs, as a result of what may be termed unit profit sharing, could undoubtedly be effected in many branches of mining. It is not uncommon in some districts to pay the muckers and trammers a bonus for each car over a fixed minimum. Theoretically, the system could be extended to drilling, hand picking, etc. Practically, there are difficulties in the way other than those enumerated by Doctor Payne.

In the first place, the cost of ascertaining the amount of work done may be more than the saving effected. Thus, when muckers are paid by the car, one or several trusted company employees must be detailed to keep track of the cars delivered and with miners paid by the foot of hole, rapid work is necessary between the completion of drilling and blasting time, on the part of the company representatives, who measure up. But a more serious obstacle is the opposition of the unions, which have always fought contract, piecework, or bonus systems in their various forms. From their own point of view, the unions are likely justified. Payment by any other method than day's pay gives an opportunity to beat down prices against which they have no recourse. It is a pity, however, that mutual distrust between employee and employer should prevent the application of human effort in the most efficient manner, with resulting profit to both parties.

It is to be regretted that Doctor Payne does not chronicle the conclusion of the experiment. Why was it discontinued before the close of the season? Was it begun again in 1913, and with what results? On the face of the figures given, it would seem to be a scheme well worth while and full of promise.

BY THE WAY

According to a New York daily, "the heaviness of steel is due to the new tariff." So is the lightness of hydrogen, we imagine.

⁂

The production of crude copper by the mines and smelteries in August, 1913, according to our statistics, was 128,415,428 lb., compared to 139,315,203 lb. in July. The check in the production of the Michigan smelters, due to the strike, showed its effect for the first time in the August statistics.

⁂

And here is a miracle, a modest inventor: "I cannot say we have obtained anything like perfection yet with the process, but we have amply proved that gold can be successfully, economically, and simply recovered. Rome wasn't built in a day, and a perfect gold-extraction process cannot be built up in a few weeks." And working on some lines, one never does get it.

⁂

Report comes by way of the *Daily Consular and Trade Reports* that a discovery of hematite has been made on the Kleena River, in British Columbia. It is said that "a large body of ore has been moved by a glacier and deposited over an area a mile square." It is not stated where the glacier got it. Water transportation of iron ore on the Great Lakes is deservedly famous, and cheap ocean freights, we hear, are going to do for Chile and Brazil what they have done for Cuba, in rendering remote iron deposits available. But this water transportation has nothing on the glacial method for cheapness. Glacial freights ought to approach absolute zero. We omit consideration of the time element.

⁂

A prominent iron-mining man, of Duluth, who formerly was active in the logging business, was reminded of an interesting reminiscence the other evening. It was suggested by some remark incident to the special election in Duluth on a liquor issue: "There is a chap writing articles in Chicago about the high cost of living, and he begins each of them with the question: 'Who gets the money?', and I often wonder who eventually got the money that was spent by the woodsmen whose headquarters was Seney, Mich., about 20 to 25 years ago. I mean the money that was squandered. Seney had a population of about 300 and there were 42 saloons there in the early days, and 7000 to 10,000 woodsmen worked in the territory near Seney. It is no exaggeration to say that 90% of the men blew their wages in those booze dens. We can trace the money that far, but when I recall that practically every one of those saloonkeepers left Seney broke, and they did not spend the money building up the town, it makes me wonder what became of it. That is an interesting problem for some of those chaps who are inclined to nosing out statistics."

⁂

It is hard to understand why any miners stay in this country. Read these menus from the Robinson Deep mess on the Transvaal:

LUNCHEON	DINNER
Soup:	Soup:
Giblet.	Printanière.
Fish:	Fish:
Boiled Stock Fish and Egg Sauce.	Crumbed Silver Fish.
Entrees:	Entrees:
Grilled Rump Steak and Chips.	Stuffed Roast Chicken.
Macaroni Cheese	Scotched Eggs and Brown Sauce
Cold Joints:	Hot Joints:
Roast Sirloin of Beef.	Roast Sirloin of Beef and Yorkshire Pudding.
Roast Leg of Mutton.	Roast Haunch of Mutton.
Roast Lamb and Mint Sauce.	Roast Lamb and Mint Sauce.
Boiled Pressed and Corned Beef.	Vegetables:
Potted head, Polony.	Baked, Boiled and Mashed Potatoes, Cabbage, Boiled Onions.
Vegetables:	Sweets:
Mashed and Boiled Potatoes	Apple Charlotte.
Sweets:	Fruit, Cheese, Tea, Coffee.
Blanc Mange and Fruit Salad.	
Fruit, Cheese, Salad, Tea, Coffee.	

And you get this for $32.50, $30 or $22.50 per month, depending on what you are earning. The control of the table is in the hands of a committee of the mine employees, according to the *South African Mining Journal*, and the same fare is served to the department heads, their subordinates and the workmen. The surroundings of the dining rooms are stated to be unusually pleasing and the service excellent. We have seen equally attractive menus in this country, following which the meal itself was a disaster in quality or quantity, or both. It is affirmed, however, that these eats were of unsurpassed quality, or good as could be had in the Park Station restaurant of the South African Railways. This is probably equivalent to saying, "as good as the Harvey House in El Paso." And for a dollar a day! Why did the Rand miners strike and why is there difficulty in getting good men?

PERSONALS

Loyal W. Trumbull is now State Geologist of Wyoming.

J. V. Culbert is now superintendent of the Wasabika mines, West Shiningtree, Ontario.

Arthur V. Davis, president Aluminum Co. of America, Pittsburgh, has sailed for Europe.

John Power Hutchins was married to Miss Elizabeth McNear on Oct. 15, at St. James Church, Paddington, London.

A. B. Lucas, superintendent of coke ovens for the Dominion Iron & Steel Co., at Sydney, N. S., was in New York last week.

Stanley Graham has been appointed professor of Mining Engineering in the Nova Scotial Technical College at Halifax.

Dwight E. Woodbridge, who has been attending, as a witness, the hearings in the Steel Corporation case, has returned to Duluth.

Dr. James Douglas is in Arizona on one of his regular visits of inspection. He is expected to return to New York early in November.

George E. Farish has left Nelson, B. C., and will stop in San Francisco on professional business, until Nov. 1, before returning to New York.

N. O. Lawton has resigned as superintendent of the Miami mine, at Miami, Ariz. F. W. Maclennan, assistant manager, is in charge of the mine.

Prof. J. C. Gwillim has returned to Kingston, Ont., to resume his duties at the School of Mining, after spending several months in Western Canada.

J. B. Tyrrell, Toronto, Ont., is sailing from New York for London on the "Olympic" on Oct. 25. His address will be 224 Salisbury House, E. C., London, England.

Geo. H. Garrey, chief geologist of the American Smelting & Refining Co., contemplates severing his connection with that company in order to go into consulting work.

L. O. Kellogg, of the editorial staff of the "Journal," is visiting the iron mines of Minnesota, Wisconsin and Michigan, among which he will spend about two months.

I. N. Beavers, of Reading, Penn., and George P. Young, of Belvidere, N. J., have been appointed receivers of the Pahaquarry Copper Co., in Warren County, New Jersey.

W. L. Cummings, geologist of the Bethlehem Steel Co., has returned from a six-months trip to South America. During this time he examined properties in Chile and Brazil.

L. B. Smith, geological engineer of the Associated Geological Engineers, Pittsburgh, has started on a trip to the West Indies for the purpose of examining supposed oil properties.

Charles V. Bobb has severed his connections in Nevada and in future will be located in the Realty Bldg., Spokane, Wash., as consulting engineer, specializing in cyaniding and oil flotation processes.

The Associated Geological Engineers of Pittsburgh, are engaged in examinations of oil properties in the state of Vera Cruz, Mexico, the fieldwork being in charge of L. G. Huntley, geological engineer.

The Taylor-Wharton Iron & Steel Co., High Bridge, N. J., announces that A. E. Borie has resigned as vice-president and has been elected chairman of the board of directors and that L. W. Jones and W. L. Wright have been elected vice-presidents.

W. L. Kluttz has resigned as general superintendent of the furnaces of the Republic Iron & Steel Co. at Thomas, Ala., and on Nov. 1 will succeed J. W. Shook as vice-president and general manager of the Central Iron & Coal Co., Tuscaloosa.

R. N. Dickman, of Chicago, has become associated with Robert W. Hunt & Co. in the United States and with Robert W. Hunt & Co., Ltd., In Canada. His headquarters will be in the Insurance Exchange, Chicago. He is now engaged upon the examination of gypsum and coal properties in Western Canada.

C. C. Whittier has been made treasurer and general manager of Robert W. Hunt & Co., Ltd., with headquarters in the McGill Building, Montreal. He has been residing in Winnipeg, in charge of the company's business in that district, but has moved to Montreal. T. C. Irving, Jr., has been reëlected vice-president of the company and will remain in charge of the business in Toronto and the surrounding district.

OBITUARY

John Fallon died at Wilkes Barre, Penn., Oct. 14, aged 62 years. He was for many years an active member and officer of the United Mine Workers of America, and was especially prominent as assistant to John Mitchell at the time of the great anthracite strike of 1902. He was also active in securing the passage of the present mining laws of Pennsylvania.

Wilhelm Schulte died suddenly in Overpelt, Belgium, in his sixty-second year. He was a self-made man and was prominently identified with the zinc industry in Europe. He was closely associated with all industrial enterprises of Beer, Sondheimer & Co., and the Tellus Aktiengesellschaft and built up the Companie des Metaux Overpelt-Lommel, one of the most uptodate zinc smelting plants in Europe. He was the moving spirit in this enterprise from its inception 25 years ago. He had the reputation of being one of the ablest zinc-smelting men in Europe and was also well known in this country, having been here in a consulting capacity at different occasions.

Donald C. Mackinnon, who, with his brother Alexander, discovered iron ore in the Iron River district of Michigan, died at Iron River, Oct. 11. He and his brother walked to Iron River from Commonwealth, Wis., which was then the terminal of the railroad, in 1878. The two pioneers, believing that the district was to prove a valuable one, located what is now known as the village of Iron River. They also located the lands on which are now the Kinney, Baltic and Youngs mines, and did some test-pit work but not enough to prove that they really contained the large orebodies which have since been shown up. The first mine opened by them was the Beta. In all, six mines have been opened on the Mackinnon holdings. Donald C. Mackinnon made quite a fortune, part of which be invested in real estate in California, where he usually spent the winter months. He was a geologist of reputation and had an excellent knowledge of the entire Lake Superior region.

SOCIETIES

Society of Chemical Industry—The next meeting of the New York Section will be held Oct. 24 at Rumford Hall, 50 East 41st street. The program for the evening will be: "Report on the 1913 Meeting of the Society in Liverpool," by Marston T. Bogert; "Chemistry as Affecting the Profitableness of Industry," by G. W. Thompson; "Some Problems in Industrial Development," M. C. Whitaker.

INDUSTRIAL NEWS

The Allis-Chalmers Manufacturing Co. announces the removal of the sales and engineering office of its Mining Machinery Department from Chicago to the Milwaukee works at West Allis, on or before Oct. 6. The Chicago shops will also be removed to Milwaukee in the near future. The advantages to be gained by concentrating all departments, both commercial and manufacturing, at one plant are the reasons for this move.

General Electric Co., Schenectady, N. Y., report the following orders recently received: The Witherbee-Sherman Co., Mineville, N. Y., for 300-hp. motors, three 100-kw. and three 300-kw. transformers and two switchboards. The Alaska Treadwell Gold Mining Co., Treadwell, Alaska, have ordered for Alaska Juneau Mine a 937-kv.-a. Curtis turbo-generator with 7-kw. motor-generator exciter set, three 333-kv.-a. water-cooled transformers and a switchboard. The Inspiration Consolidated Copper Co., Miami, Ariz., four large 2000-kv.-a. water-cooled transformers, a 500-kw. 4-unit flywheel motor-generator set with controlling equipment, two 580-hp. motors, switchboard and accessories. The Alaska Treadwell Gold Mining Co., Juneau, Alaska, four motors of 10 hp., 35 hp., 75 hp. and 100 hp., respectively, switches, etc.

The William Powell Co., Cincinnati, Ohio, Manufacturers of Powell valves, especially the "White Star" valve, have just issued a circular on the Powell Union Composite Disc Valve for steam and hot-water heating, describing the new design and illustrating it. Copies of the circular will be mailed to any engineer on request.

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—Oct. 16

The Petroleum Industry of California will be the subject of a special bulletin to be issued by the State Mining Bureau, the preparation of which was lately begun. This bulletin will cover the occurrence of oil-producing sands, the geology, the production, transportation, refining, marketing and various uses of petroleum. It is the purpose of the state mineralogist to include as full information as possible regarding every known petroleum occurrence in the state. Data will be gathered and published concerning methods, costs and results of drilling, pumping, refining and storage; the transportation costs by rail, water and pipe line and the capacity of pipe lines.

The Mother Lode Region in Amador County produced the largest amount of gold of any county in California in 1912, being credited with a production of $2,796,194. The four other counties of the Mother Lode region, Calaveras, Eldorado, Mariposa and Tuolumne, produced an aggregate of $2,341,542, making a total gold production in the Mother Lode region of $5,137,736. After Amador, the largest producers in their order were Yuba, $2,753,408; Butte, $2,346,229; Nevada, $2,081,958; Sacramento, $1,712,587; Tuolumne, $1,113,291. Gold was produced in 32 counties but only the counties named produced as much as $1,000,000. The total tonnage of treated ores produced in the state in 32 counties was 2,641,497 tons. Amador County produced 737,148 tons; Calaveras, 430,128 tons; Shasta, 415,116 tons; Nevada, 270,148 tons; Tuolumne, 228,823 tons; Kern, 168,226 tons. The large tonnage in Shasta County consisted chiefly of copper bearing ores. Shasta County's gold production was comparatively small. The small tonnage treated in Yuba County and the no tonnage in Sacramento County, while those counties were large producers of gold, is due to the fact that the production was from dredging operations. There is comparatively little quartz mining in Humboldt, Los Angeles, Merced, Stanislaus, Sacramento, San Luis Obispo and Yuba Counties, although they are all gold producers to a large or small extent. The total average value of all the ore sold or treated in California in 1912 was $6.71 per ton.

DENVER—Oct. 18

Lawlessness in the Southern Coal Fields continues, the strikers being apparently encouraged by the failure of the state authorities to make any decisive move to restrain them. The situation on Oct. 14, was marked by the capture of 15 deputy sheriffs by a mob of 200 striking miners at Trinidad, and an attack on Marshall Corey, of Segundo, by armed strikers, who dragged him from his horse, stole his gun and beat him badly. Guards came to his rescue and several shots were fired but no one was hurt. The 15 deputies, bound for Ludlow, were taken prisoners at the Colorado & Southern station, hustled to the headquarters of the union and held prisoners for more than an hour, while Sheriff Grisham and a number of deputies stormed and argued in an effort to obtain their release. They were set free only after a show of force had been made. However, state officials began making final preparations, Oct. 15, for calling out the militia if necessary, as it became apparent that a crisis in the strike situation was not far off. The state auditing board authorizes issuance of certificates of indebtedness to finance the troops, and the clearing-house bank heads met with the governor to make arrangements for floating these certificates. General passenger agents of railroads also met the chief executive to complete traffic arrangements for transportation of militia. Ammunition has also been sent to Trinidad and Pueblo for the southern coal fields, and also to the northern fields for the use of the militia if it becomes necessary. The operators assert that the number of miners out on strike is 5000, or approximately 30% of the total number of men employed under normal conditions. The officials and the headquarters of the miners' union say that strike benefits were paid during the first week of the strike to 11,232 men in the southern fields alone, and that a few applications have come since that date. Both sides are prepared for a long struggle and it is feared that the strike will continue many months. If it lasts another 30 days it is estimated that the cost to the state will be $150,000 per day.

BUTTE—Oct. 15

A Slime Concentrator will be built by the Anaconda company at the Washoe works at an estimated cost of $650,000. The plant will comprise 20 of the 20-deck round tables that have already been tested in an experimental plant and will have capacity for treating about 2500 tons of material per 24 hr. The new plant will recover about 1,000,000 lb. of copper per month from slime that heretofore has been running into the pond.

Coal Rates, according to orders given by the interstate commerce commission, must be placed high enough on coal shipped from Sheridan, Wyo., to Montana points to protect the operators in the Bear Creek, Mont., coal fields. These rates are a considerable increase over the original ones and were obtained as the result of the Montana commission asking for a rehearing, in which evidence was offered to prove that it costs more to produce coal in Montana than in Wyoming, and that under the original rates ordered. Montana mines would have to suspend operations.

SALT LAKE CITY—Oct. 16

Improvements at the Garfield Plant of the American Smelting & Refining Co. are now being made. The new steel bridge over the railroad tracks north of the plant leading to the slag dump north of the old dumps has been finished. This will give an extensive area for slag dumping, as the ground originally used is not adequate. Arrangements are being made for a new stack near the one now in use, and excavating for the flues and stack has been finished. Work of laying concrete is in progress. The stack is to be 350 ft. in height, and 25 ft. in diameter. The stack now in commission is 300 ft. high, and 30 ft. in diameter. It is planned to use both stacks at the same time. All the reverberatory furnaces at Garfield have been equipped for burning crude oil, as those equipped experimentally, some time ago, gave satisfactory results. The largest tonnage in the history of the company is being treated, which includes concentrates from the Utah Copper, Ohio Copper, ore from the Yampa, etc.

CALUMET—Oct. 18

The Copper Country Commercial Club appointed a committee to investigate conditions and offer its offices in an endeavor to bring about a settlement of the labor dispute in the Lake Superior copper region. The committee has completed its report and submitted it to Governor Ferris and the public. The report covers the history of the district and a comparison is drawn with this district and Butte, going into details on the copper contents of the ore, the cost of mining, living conditions and the cost of living, etc. The report takes up the various demands made by the Federation and contains several tabulations, showing hours worked, wages paid, men employed, and working conditions in the various mines insofar as the committee was able to obtain from personal observations and investigations. The officials of the Federation were asked to present their side of the question to the controversy but refused. The tracks of the Keweenaw Central R.R. were blown up by dynamite this, Saturday, morning. Two coaches of men employed as mine guards for the Mohawk Mining Co. were being taken to the property over this route. When near Copper City the engineer noticed the fuse burning and stopped his train about 100 ft. from the point where the explosion almost immediately after the train was brought to a stop, wrecked the track. Nearly all incoming trains are bringing men to work in the various mines. At the Calumet & Hecla two large bunk houses have been built and two more are underway, and this property is rapidly increasing its force. Night shift was started in three more shafts during the week and the next week will see practically all of the shafts operating full time. At the mills 22 heads have been operating all week and it is likely that one of the mills will run the regular 24-hr. shift next week. During the week, a number of the employees of the Wolverine mine met and started a back-to-work movement. Conditions throughout the north end of the district are bad and lawlessness and disorder continue despite the injunction.

DULUTH—Oct. 18

Enjoinment Was Refused by both the state of Minnesota and the federal court at Duluth when an effort was made to get out an injunction to prevent the Wisconsin Steel Co. from discoloring the waters of Swan Lake, on the Mesabi range, by the washing of its ores. A resident of the vicinity applied for a restraining order. The state's attorney general took the position that the state would not feel justified in injuring so important an industry for so slight a cause, whereupon appeal was made to Federal Judge Page Morris. Attorney C. O. Baldwin, opposing the petition, declared that the principle of preventing mining companies from washing their ores because waters of comparatively little use were affected would seriously embarrass the mining of 100,000,000 tons in the western part of the Mesabi, so Judge Morris refused to issue the order.

MARQUETTE—Oct. 20

Industrial Accidents, not including those that resulted fatally, have cost the iron mines of the state $30,062. According to the state industrial commission the statistics show that 15,939 men are employed in mining iron ore. There have been 817 accidents, exclusive of fatalities, since Jan. 1, and the average amount of the settlements has been $36.79. The cost to the companies per employee was $1.88. In practically all cases the mining companies carry their own risks, and the compensation they have to pay is carried as a charge against production. The copper-mine accidents were slightly more numerous than those of the iron-mining industry. With 18,456 men employed, prior to the strike, 895 accidents were reported. The total outlay in settlements was $37,209, a cost for the average case of $42.80 and for each man employed of $2.01. For the 2971 men employed in coal mining $2168 was paid to 54 beneficiaries, an average of $40.15 per case and 73c. per man. The cost of hospital and medical attendance for the coal mines was $1191. This item is not reported for the iron and copper mines, the figures given covering only the payments of money to workers. If hospital and medical attendance be included, the cost of the accidents in these industries would be increased by many thousand dollars. A summary shows that 37,366 men are employed in the mining industry in Michigan. Since Jan. 1 the industrial commission has a record of 1766 non-fatal accidents among them, for which $69,439 was paid in compensation.

LEAD, S. D.—Oct. 20

Land in the Limestone Range, within the forest reserve, has been opened to settlement as homesteads. The forest service desires to have these lands occupied partially to afford fire protection, and to settle what is at present non-productive land. The lands are within easy reach of the markets in the mining camps of the Black Hills, and under cultivation will produce good crops of grain, potatoes, hay, etc., which would be of great benefit to the miners.

The Mining Industry in the Black Hills is in a prosperous condition as is evidenced by the receipts of bullion at the U. S. Assay Office, at Deadwood, which were $2,018,500, during the quarter ended Sept. 30. This is one of the largest totals ever handled in a similar period of time at this office. These figures represent only the bullion production from the mills of the district. Proceeds of ores shipped to smelters at Denver, Omaha, and other places, figures for which are not available, formed a considerable item. At the present rate of production South Dakota should exceed its production record of last year, which was the greatest in its history.

A New Slime Thickener has been invented by H. M. Gunn, of Deadwood. It may also be used as an agitator or a settler. The inventor has recently completed a small machine in which tests are being made. The device consists essentially of a tank with conical bottom, in which is set a hollow shaft to which are attached two sets of propeller-shaped blades. They are so arranged that they may be adjusted to various positions. Attached to the lower set of blades are perforated pipes, connected with the hollow shaft, and through which either air, water or solution may be admitted. Running at 4 r.p.m., the machine is an efficient thickener, the blades tending to hasten settling by giving the material a downward impetus. Running at 12 r.p.m., and introducing air through the pipes connected with the lower blades, the contents are subjected to a violent and apparently thorough agitation.

Good Roads in the Mining Districts of the Black Hills are rapidly becoming an assured feature. During the last two years Lawrence County alone has spent upwards of $150,000 in what may be classed as permanent improvements, in the construction of first-class highways through the mountains. The campaign is to be continued from year to year until all parts of the Hills are connected with good automobile roads. During the present summer $30,000 has been spent on what is called the Lead-Crossing road, westward from Lead to Spearfish cañon, and passing through the Ruby Basin mining district. A branch is being constructed to Terry, the principal camp of the Bald Mountain district. A portion of the funds comes from the government, which gives to the various counties a portion of the moneys received from sales of timber within their boundaries. The other mining counties, Pennington and Custer, are not far behind Lawrence in the good-road movement and the time is not far distant when the entire Hills will be traversable over the finest class of macadamized roads.

COBALT—Oct. 18

An Amalgamation of the properties controlled by certain English interests in Cobalt is rumored. The syndicate in question originally controlled the Townsite and Casey Cobalt mines, and subsequently purchased the City of Cobalt and the Cobalt Lake. A short time ago the Northern Customs Concentrator was taken over, in order to treat the low-grade ore from the Townsite and City of Cobalt. If this amalgamation goes through, as seems altogether probable, it will be one of the largest combinations in Northern Ontario, and will rank with the Nipissing in the total value of its production.

TORONTO—Oct. 20

Iron Carbonate Ores of the Magpie mine, near Sault Ste. Marie, have been experimented with and the possibility of roasting these ores and obtaining a high-grade product has been successfully demonstrated on a commercial scale. Development of this property has proved a large tonnage of siderite, which carries about 35% iron, and for some time past the company has been experimenting with processes for roasting the ore and raising the grade to about 56%. One unit of the plant has been in successful operation for several months, and it is now stated that the company will install five additional units.

The Sterling Mines near Arsenic Lake in Northern Ontario, which have been in litigation for a number of years, were purchased at auction by the Montreal Trust Co. for $230,000. The properties were originally owned by Major R. G. Leckie, who sold them to William Marshall for $250,000, of which it is stated $210,000 remains unpaid. The action for this unpaid balance was carried through the Ontario courts to the Privy Council, but so many complications arose that the master-in-ordinary was authorized to sell the properties at public auction. The properties were first put up last July and sold to M. B. Sullivan, of Boston, for $300,000. The purchaser failed to pay over the money so they were again put up and sold to the Montreal Trust Co. Deposits of gold, silver, copper and arsenical pyrite ores exist in the mines and when first developed, it was planned to build a smelting works which would also treat the ores from Cobalt.

MONTREAL—Oct. 18

The Canada Iron Corporation lately went into liquidation, and pending reorganization arrangements are being made to continue the operation of the various plants. A special meeting of the holders of both first and second mortgage bonds was called for Oct. 17 to pass resolutions to enable the Montreal Trust Co. to make the necessary arrangements to permit operations being continued. One resolution would authorize the trustees to borrow money from time to time for carrying on the business and other purposes of the corporation, but these sums are not to exceed $250,000 at any one time. Such money as may be necessary will be secured by mortgages which will rank in priority to the existing bonds.

The Canadian Coal & Coke Co. recently failed and in this connection and its subsidiary companies, the Western Coal & Coke Co., Pacific Pass Coal Fields, the St. Albert Collieries and the Lethbridge Collieries, it is stated that these companies have not been vested in the Canadian Coal & Coke Co. The authorized capital of the Canadian Coal & Coke Co. is $15,000,000 of which $4,000,000 is preferred and $11,000,000 common. Of this amount, $3,750,000 preferred and between $9,000,000 and $10,000,000 common stock has been issued. The Canadian Coal & Coke Co. has also authorized an issue of $3,000,000 bonds, the proceeds of which will be appropriated to discharge current liabilities incurred by the above companies in carrying through their development work and the balance for completing the development and equipment of the properties and for working capital. Negotiations for the passing of these bonds are now in progress.

THE MINING NEWS

ALASKA

A SHIPMENT FROM FAIRBANKS was received at the U. S. Assay Office in Seattle, Oct. 3. The gold bullion was worth $140,700.

AT THE AMERICAN MINING CONGRESS Alaska will be represented by the following delegates appointed by Governor Strong: B. L. Thane, Juneau; R. A. Kinzie, Treadwell; Charles S. Sulzer, Sulzer; B. F. Millard, Valdez; John Ronan, Fairbanks; R. S. Ryan, Katalla; William Maloney, Nome and Milo Kelly, Knik.

DOCTOR HOLMES HAS RETURNED from a six-months' investigation of the Matanuska and Nenana coal fields. He says there are both anthracite and bituminous deposits in the Matanuska fields. The Government has just completed mining 900 tons of anthracite there for tests by the navy and Dr. Holmes would express no opinion concerning its quality. In the Nenana field, tributary to Fairbanks, there are vast deposits of lignite, which will be of use in the territory in operating steam plants and railroads.

IN THE SHUSHANNA DISTRICT more work will be done this winter than last summer. Tons of supplies will be carried in, and preparations will be made for the coming season's operations. Travelers will be coming and going all winter. The question arises of what route is best to follow. Those acquainted with the northern camps will not hesitate to choose the route patrolled by the Northwest mounted police. That route lies up the White River. Three police posts already have been established there. The gold dust has come out, largely by this route, and should continue to come this way. The White River is not only to be patrolled by the police, but good roadhouses are to be provided every 20 miles along the route. Mushers coming in from the outside can go down the White Pass route, then go up the White River, either from the Stewart or Dawson and be within call of the police all the way.

ALASKA TREADWELL (Douglas)—The main shaft house has been destroyed by fire, at a loss of $40,000. It was only through heroic efforts that the rest of the plant was saved from complete destruction. In August 80,973 tons of ore were crushed for a yield of $200,971 in gold and concentrate, or at the rate of $2.50 per ton. The net profit was estimated at $95,368.

ARIZONA

Gila County

ARIZONA COMMERCIAL (Globe)—An electric hoist has been installed on the 1200 level, preparatory to sinking to the fourteenth level. Considerable improvement is noticeable on the surface, a 30-ft. change room having been built.

GIBSON COPPER (Globe)—This property has been acquired by St. Louis men. The mine began producing high-grade ore on a large scale about eight years ago, and during the last two years more than $2,000,000 worth of high-grade copper ore has been taken out. It is estimated that there are about 200,000 tons of low-grade ore, valued at $1,000,000, now on the dump awaiting treatment. The new owners will erect a concentrator.

OLD DOMINION (Globe)—All construction work in the new crusher plant and sampling mill is practically completed. It was anticipated that the A shaft would be in commission for hoisting ore with skips by Oct. 20, and soon after that date ore hoisting at the Kingdon shaft was to be discontinued. The A shaft is being repaired and lined between the cage and skip compartments. Development work and ore extraction in the mine for the last three weeks has been reduced considerably, owing to the repairs at the A shaft, which prevented hoisting. Erection of the steel work on the new concentrator is making good headway.

INSPIRATION CONSOLIDATED (Miami)—Several raises are being lifted and sublevels have been started in the Colorado orebody, making it seem certain that this orebody will be worked in the same manner as the Joe Bush orebody, which is being blocked out for caving. Work is being rushed in the drift on the sixth level to connect the incline with the Scorpion shaft, and it is probable that all waste will be taken out the incline shaft to the pocket on the third level, and be carried from there out through the tunnel or be hoisted at the Colorado shaft. Connection is about to be made on the fourth level between the main east and west shafts, but stations will not be cut at once as the shafts will be concreted for their entire depth. All the Inspiration, and maybe all the Live Oak ore, will be hoisted through the two main hoisting shafts. Rapid progress is being made with the concrete pouring at the coarse-crushing plant site. All of the machinery for the crushing plant which will supply the test mill with its 600 tons daily, is now at the Scorpion shaft, from which the ore will be taken. The test mill will not be ready for several weeks yet. Superintendent Webster, of the American Bridge Co., states that about 75% of the steel to be used in the mill is now on the ground. Another gang of steel workers left Chicago Oct. 8. Considerable steel construction has already been finished at the machine shop and warehouse section of the concentrator.

Yuma County

BILLY MACK (Parker)—There is an old, dismantled stamp mill on this gold- and copper-ore property. More gold went out in the tailings than was caught on the plates in the days when the mill was in operation.

A. L. P. GROUP (Parker)—At this mine ore assaying from $15 to $50 per ton is being developed. At one place on a peak 200 ft. high, three veins come together, one of which is 25 ft. wide. Some well-advised prospecting work is being done here and bonanza ore may be opened.

MAMMOTH—A 75-ton cyanide plant has been installed on this property owned by the Young Mines Co. The ore from the dumps mixed with mine ore is being used in a test run. If satisfactory results are obtained the plant will be enlarged. The old Mammoth 10-stamp mill is used to crush the ore, the coarse gold being recovered by amalgamation.

ROBERTS-ALLEN, MAVIS (Parker)—This mine is on the north side of the Carnation. A 5-ft. copper-gold orestreak has been opened all the way down the 100-ft. incline shaft. Half of the streak is smelting ore, which is shipped to the Phelps-Dodge plant, at Douglas. It returns better than $50 per ton net. The vein crops above the collar of the shaft for a height of 50 feet.

CARNATION (Parker)—The ore in this mine occurs in a dome-shaped hill, 200 ft. high by 300 ft. in diameter, that has been sampled all over its surface, yielding average results of $27 in copper and gold per ton. A 300-ft. shaft has been sunk from the bottom from which an 80-ft. drift has been driven, all in copper and gold ore, that assays from $40 to $80 up to $200 per ton on shipments. The ends of this oreshoot have not yet been reached. All this work has been done by hand, using a whim-hoist.

CALIFORNIA

Amador County

FREMONT (Drytown)—It is reported that the company contemplates adding one or more units of 20 stamps to the 40-stamp mill. The mine is a steady producer and dividend payer.

ZEILA (Jackson)—It is reported that negotiations are again in progress for the sale of the mine and mill. No supplies are being ordered for continued work by the present owners. The mill is still running on ore from near the surface and all material carrying any gold is said to be going through. The taking over of the property by a strong company is expected, and in that case there is no doubt that the exploration of orebodies below the present working will be undertaken.

Butte County

GARDELLA DREDGES (Oroville)—Dredging at Honcut has stopped temporarily on account of water shortage. Water has been furnished by the Palermo Water Co.

BERRY CREEK (Berry Creek)—This mine, owned and operated by Kinkaid & McClung, is reported shut down temporarily on account of water shortage.

BOSTON NO. 4 (Oroville)—This dredge, operating in the Thermalito field, across the river from Oroville, has been facing a shortage of water. It has been necessary to pump water from old dredge ponds.

Shasta County

FIELD SMELTING PLANT (Redding)—The new process furnace, invented by A. U. Field, will be installed at Redding. It is reported that the Western Pipe & Steel Co., at Richmond, has the contract for building the furnace, and that the plant is expected to be in operation in November. This is to be a practical furnace for the treatment of sulphide ores by a process that it is claimed will eliminate the fumes. The money for the installation of the trial furnace has been raised by Redding men chiefly. Dr. Sherman T. White, S. D. Furber and George Baker represent the subscribers.

Siskiyou County

OSGOOD (Yreka)—A 5-stamp mill has been purchased and will be installed immediately. The mine has been prospected and developed for the last three years, showing sufficient ore to warrant the mill.

Sierra County

WHITE BEAR (Downieville)—Rapid progress is being made in a 130-ft. raise to gravel in the New York tunnel, and pay gravel is expected.

TIGHTNER (Alleghany)—A $50,000 pocket has just been extracted from the main workings and much new ground is being opened, making the chances good for additional rich strikes. The new 10-stamp unit of the mill will be ready for operation Nov. 1, and the property is being put in shape for uninterrupted winter work of mining the milling ore already exposed and the reserves which are being steadily augmented. On what is considered reliable authority, it is stated that the output is approximately $2000 per day, with operating expenses of $6000 per month.

WYOMING (Alleghany)—This old mine in the Deep Blue gravel diggings is being reopened by the Dead River Mining Co., composed of Pennsylvania people. While being worked as a drift mine several years ago, a rich vein was encountered in the west rim, and all energy was then directed to its development. Litigation arose and delayed operations until a recent amicable settlement and a new treasury fund permitted renewal. A force of 15 to 18 men is employed in re-excavating and retimbering the caved portion of the long tunnel, and preparing for work throughout the winter. The vein was originally exposed under the lava in two places, 300 ft. apart, showing from 2 to 5 ft. of ore, carrying free gold and arsenical sulphides, one shipment of which, after sorting, returned $800 per ton in gold.

COLORADO

Clear Creek County

SHIPMENTS FROM BLACK HAWK to the Denver reduction works totaled 38,000 tons of concentrates in September.

FRONTENAC—This mine, in Willis Gulch, which was sending from 10 to 15 carloads of ore daily to the Frontenac mill, in Black Hawk, has all been closed down pending a change of managers.

CALHOUN—At the 400 level of this mine, in Leavenworth Gulch, an 8-in. streak of high-grade smelting ore is being mined and a big tonnage of milling ore is also being produced. A retort of 35 oz. of gold has just been sent out.

DONALDSON—The Rockford Leasing Co., under the management of John Larson, has secured a lease on this and the Centurian groups of mines on Donaldson Mountain. Development has been resumed, and it is reported that the lessee has ample funds to carry out the proposed scheme of exploration. The east drift on the Donaldson vein will be advanced an indefinite distance.

Gunnison County

A DEPOSIT OF MARBLE, said to be 1500 ft. wide and five miles in length, has been opened, it is stated, in the Quartz Creek district. It is one mile from Quartz Station, in the South Park of the Colorado & Southern R.R. The deposit contains the white and gray variety and also the variegated marble misnamed "onyx." This new find near Pitkin adds another big industry to the resources of the state. The work of exploring this deposit has continued for two years, but it has been kept quiet by the owners, who are chiefly citizens of Pitkin.

Lake County

AN INVESTIGATION OF LOW-GRADE ORES, at Leadville, is being made by F. W. Horton ,of the Bureau of Mines, and F. B. Laney. The object is to determine the best milling process. Samples are being sent to the experimental station at Denver for analysis, and the coöperation of the mining men of the district has been freely given. Twenty members of the Empire Zinc Co. are also in Leadville, ascertaining the amount of zinc ores blocked out in the company's properties. They will also visit the other zinc producers.

Pueblo County

COLORADO FUEL & IRON CO. (Pueblo)—At the recent annual meeting President Welborn reported satisfactory progress in handling the strike. Operations in the fuel department, it is said, will soon be on a normal basis. It is rumored that provision will be made for paying off the 39% accumulated dividends on the $2,000,000 preferred stock.

Summit County

COLORADO GOLD DREDGING CO. (Breckenridge)—This company, operating on Swan River, produced 1000 oz. of gold, which was shipped to the Denver Mint, Oct. 2, in two bricks, valued respectively at $8600 and $6800. In the five years during which their Bucyrus boat No. 2 has been operating, it is credited with a probable gross revenue of $400,000 per year.

Teller County

GOLDEN CYCLE (Goldfield)—A report is current in Denver that the Golden Cycle mine, mill and coal mines, have been sold to Englishmen for $5,000,000, by Allan Burris, president of the El Paso company, and who is now in London. No official confirmation of the rumor, however, has been obtained. At the same time it should be remembered that a suit is pending between the Vindicator Consolidated and the Golden Cycle, to recover the value of $2,000,000 worth of ore, which, it is alleged, the latter wrongfully abstracted from the former's territory. The suit is set for trial within a short time and it is hardly probable that the British syndicate is buying a lawsuit.

IDAHO

Cœur d'Alene District

CALEDONIA AND BUNKER HILL & SULLIVAN litigation will be settled and a compromise brought about, states William A. Nicholls. He says that the agreement reached between representatives of the interested corporations provides for increasing the capital stock of the Caledonia to 2,600,000 shares, twice the present outstanding capitalization, half of which will be taken over by the Bunker Hill & Sullivan. In addition the Caledonia is to be consolidated with a number of surrounding properties owned by the Bunker Hill & Sullivan to eliminate all possibility of future litigation over boundaries and apex rights, and an incline raise is to be cut upward from the lower Bunker Hill tunnel into the Caledonia workings, tapping the orebodies not less than 300 ft. below the present lower workings. This will permit hauling all the Caledonia ore through the Bunker Hill main working tunnel, where an electric haulage already is installed, and provision has been made to set aside one unit of the Bunker Hill mill for treatment of the product. This means a big reduction in mining and milling cost for the Caledonia, besides obviating the necessity of building a new mill, at an expense of not less than $200,000, which would have been necessary even had the Caledonia company won out in the suit with the Bunker Hill now pending in the Federal courts. The negotiations will be advanced sufficiently in the next few days to permit resuming operations at the Caledonia, unless unforeseen obstacles intervene.

Nez Perce County

SLAUGHTER HOUSE GULCH—Frederick Forsman, of Lewiston, has made a discovery in the gulch. The vein as exposed is 18 in. wide and samples of the ore show free gold, visible to the naked eye. The find was made near Pierce.

POT MOUNTAIN DISTRICT—W. P. Bounds, of Lewiston, reports that a stampede is in progress to this district, in the upper North Fork country, where copper ground is being located. A rumor that the Northern Pacific is to build through the North Fork country has revived interest in the mining properties.

MICHIGAN

Iron

ALGOMA—The overloading and wrecking of the company's receiving dock at Sault Ste. Marie, Ont., precipitating thousands of tons of ore into the water, has resulted in the cancellation of the contract for iron ore made last spring between the Algoma Steel Co. and the Newport Mining Co.

GROVELAND (Iron Mountain)—Due to the litigation in which the stockholders have become involved, resulting in the appointment of a receiver, the mine was shut down a short time ago. Only a small force had been employed as only exploratory work was being carried on, but every man was laid off.

MILWAUKEE-DAVIS (Negaunee)—Operations have been suspended and the workings will be allowed to fill with water. All of the available ore has been mined and shipped. The property is owned by the Mary Charlotte Mining Co., which has laid off about 200 men at its other Negaunee properties, namely, the Breitung Hematite and the Mary Charlotte.

CLEVELAND-CLIFFS IRON CO. (Ishpeming)—The Gladstone furnace, owned and operated by this company, was closed down last week. The charcoal pig iron manufactured there is not readily disposed of due to the condition of the iron market, and so it was deemed advisable to suspend for awhile. The plant has operated continuously for five years, and the management will now make needed repairs. The company's plant at Marquette is still in operation.

JONES & LAUGHLIN (Ishpeming)—This company is making preparations to open up its Iron Mountain Lake property where work was abandoned several years ago. The shaft, which is not deep, will be sunk several hundred feet further to a depth at which it is believed a body of good ore exists. No work has been done in the region, which is five miles to the south of Ishpeming, for some time, but years ago there were several mines operating within a radius of a mile or two.

VIVIAN (Quinnesec)—Pickands, Mather & Co. have abandoned the Vivian mine, and it will probably be years before it will be worked again. It was taken over by the company ten years ago and has since shipped 500,000 tons. The ore is of low grade, and the owners say that they have other ores of the same grade in other districts which can be mined for less money, and so there is no reason for continuing the Vivian. The machinery has been shipped to Iron River, where it will be installed at one of the company's newer mines.

MINNESOTA

Cuyuna Range

NEARLY PURE HEMATITE was found in hole No. 501 on the Jamison & Peacock property north of Crosby, now being drilled by Northern Pacific interests. One 5-ft. sample assayed 69% iron.

PENNINGTON (Crosby)—Stripping is nearly completed, but one steam shovel being now on this work.

KENNEDY (Cuyuna)—A large force has been put to work clearing and grading for the new stockpile. For the first time in two years, the Kennedy has shipped its entire stockpile.

IRON MOUNTAIN (Iron Mountain)—The new 3-compartment shaft, bottomed at 125 ft., is hoisting ore for the stockpile. A bucket is being used for hoisting, but the shaft is arranged for skips, which will be installed later. The Soo Ry. is building to the property.

BARROWS (Barrows)—Work was started on the new 5-compartment shaft Oct. 15. The shaft will be approximately 250 ft. deep, having two skip roads, one cage road, one pipe way and one ladder way. The present shaft will then be used as a timber shaft. The mine is hoisting 200 tons daily, all of which is going to the Lake Superior dock.

JONES & LAUGHLIN—On Oct. 10 the Northern Pacific interests gave this company a six-months' option for lease on the property known as the C. M. Hill Lumber Co. property. Exploration is to begin by Nov. 1. The property adjoins the Pennington on the west and will undoubtedly be operated as an openpit mine. Thomas Feigh, of Duluth, owns the fee to the property. This is the largest transaction on the Cuyuna range this season.

Mesabi Range

AT THE NEW MESABI No. 5 DOCK at Duluth, the steel approach will be completed by Nov. 30. Concrete work on cribbing and foundation for the dock is also nearing completion, and the steel work for the pockets is started. When completed, the dock will have 385 pockets, each with a storage capacity for 300 tons.

PERKINS (Aurora)—Property shut down Oct. 13 and shipping ceased for the season. The tonnage contracted for from this property has all been shipped.

HUDSON (Aurora)—The night crew has been laid off, but operations still continue in the daytime. The mine has exceeded its contracted tonnage this season. It is an openpit mine.

INTERSTATE IRON CO. (Grand Rapids)—The hydraulic operations are expected to start Oct. 25. It is planned to discharge the overburden a distance of over 3000 ft. from the 7-in. hydraulic pump.

Vermilion Range

WHITE LAKE IRON CO. (Ely)—This company has the construction of a crushing and concentrating plant under consideration, and if the tests now being made are satisfactory the plants will be built. The company has a large deposit of low-grade and banded ore on its lands, and the management feels that with proper process the ore can be profitably treated. Tests of the ore are being made by Witherbee, Sherman & Co., of Mineville, N. Y., and some reports have already been made, which show that 1.57 tons of crude ore as mined will produce one ton of concentrate. It is believed that finer grinding and sintering will yield better results and the experiments will be carried further.

MISSOURI-KANSAS-OKLAHOMA

Joplin District

KNIGHT LAND (Carl Junction, Mo.)—Drill cuttings taken from the fourth hole showed 8.64% metallic zinc.

TEMPLAR LAND (Galena, Kan.)—A company of four operators has developed a good producer on this tract; 10 acres are under lease. Both lead and zinc are found.

OHIO MINING CO. (Joplin, Mo.)—A 150-ton concentrator is being erected on the lease of 40 acres. Several shallow mines formerly were operated on the tract. Ore now is found at the 80-ft. level.

HALL & BARBEE (Joplin, Mo.)—Cuttings showing 15% ore have been taken from holes put down on a lease of the American Lead, Zinc & Smelting Co. The ore formation exists from 70 to 110 feet.

GOOD LEASE (Webb City, Mo.)—Carmean & Squires have purchased the concentrator and lease. The mill will be improved and new machinery installed. It is one of the old properties in the district.

KENTUCKY LEAD & ZINC CO. (Joplin, Mo.)—This new company has obtained a lease on 20 acres near the city and will begin a prospecting campaign soon. St. Louis and Joplin men are interested in the company.

A. B. C. (Joplin, Mo.)—Fire destroyed the concentrator last week, causing a loss of $20,000; it will be rebuilt near a new shaft. Recent improvements on the plant and a development campaign cost the company $6000.

PRODUCER (Joplin, Mo.)—Week before last the mine produced 87,620 lb. of zinc sulphides, being milled in a new concentrator. Seven months of development work has made the property one of the richest in the North Joplin field.

MONTANA

Butte District

BUTTE & SUPERIOR (Butte)—The Minerals Separation Co. has brought suit to enjoin the Butte & Superior from using the so called Hyde oil flotation process.

EAST BUTTE (Butte)—Operations have been resumed on the Dutton, the original property of the company. Hoisting of ore began a few days ago from the 400 level.

DAVIS-DALY (Butte)—A daily average of from 225 to 250 tons of ore is being hoisted and shipped from the Colorado shaft, the ore coming from the 1200-, 1400-, 1500- and 1900-ft. levels. In the latter part of September the company partially suspended operations for two days because of a shortage of cars, but since then the output has been about normal.

Chouteau County

RUBY GULCH MINING CO. (Zortman)—The mill was totally destroyed by fire Oct. 7. The company carried $141,000 insurance on its holdings, a portion of which was on the mill.

Gallatin County

MONTANA CONCRETE CO. (Logan)—This company has completed the building and equipment of a concrete-brick factory after several months' work, and is now in a position to make bricks at the rate of about 30,000 per day. Several kinds of plain and fancy-faced blocks, including the ornamental ruby brick, will be made at this plant.

Granite County

SWASTIKA (Philipsburg)—A new compressor plant and pump have been installed, and sinking is going along steadily. The company will cut a station on the 200-ft. level and begin development work. Ore of shipping grade is being hoisted from the bottom of the shaft and the management is preparing to ship the ore on the dump.

GRANITE-BIMETALLIC (Philipsburg)—A strike of high-grade silver and gold ore has been made on the 100-ft. level. The property was considered practically worked out many years ago, and has been abandoned except for a few lessees, who have operated in a small way. It is stated that the company will put on about 35 men and thoroughly develop the orebody.

NEVADA

Churchill County

BROKEN HILLS—A shipment of ore which assayed $75 per ton has been made to the Western Ore Purchasing Co.'s plant at Hazen. The ore was hauled 74 miles by wagon. Further shipments will be made.

Humboldt County

NEVADA QUICKSILVER CO. (Winnemucca)—Articles of incorporation were filed by this company recently.

PEERLESS NO. 2 (Rochester)—Lessees on this claim and on the Supreme shipped recently what is thought to be the richest car from Rochester to date. The smelters settlement was $2612 for 20 tons.

Lyon County

A NEW POWER LINE is being built by the Truckee River General Electric Co., from the substation in Virginia City to Silver City.

BENWAY (Rio Vista)—The shaft which is 70 ft. deep has cut a quartz vein 2½ ft. wide, which carries silver and copper. The crosscut tunnel is in 103 ft., and will be driven to connect with the shaft at depth.

NEVADA-DOUGLAS (Ludwig)—A survey is being made here of a millsite for the proposed leaching plant, in order to determine the advantages of this site, if any, over those of the previously selected site at Hudson.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Oct. 9, 1913, were as follows: From Mason Valley mine, 2267 tons; from Nevada-Douglas, 1028 tons; from other mines 1029 tons; total, 4324, or a daily average of 618 tons. During the same week four cars of matte were shipped.

Mineral County

A NEW CINNABAR DISCOVERY is reported from the camp of Cinnabar, near Mina. The discovery was made about three-quarters of a mile north of the Summerfield discovery. The ore is exposed in an opencut, and is of considerable width and of good grade.

NEVADA BLACK & GOLD MARBLE CO. (Mina)—The holdings of this company, consisting of 140 acres north of Mina, were sold recently. The initial payment of $25,000 has been made. Cranes, a compressor, channeling machines, etc., will be installed at the quarry at once. It is stated that a sawing and polishing plant will be built at Mina, involving an expenditure of $40,000. The marble will be squared at the quarry and transported on 10-ton auto trucks to the finishing plant.

Nye County

BIG FOUR (Manhattan)—An attempt is being made to increase the water supply of the mill. If successful the capacity of the mill will be increased from 100 tons to 150 tons per day. A shoot of good-grade ore has been opened on the 100-ft. level on Block 9. An orebody east of the mill will be glory-holed.

Washoe County

ELECTRIC MINING & SMELTING CO. (Reno)—A test run made on 300 tons of ore by the Loder process is reported to have been an entire success. The process involves the use of fuel oil as a partial substitute for coke. It is stated that a larger unit will be erected.

White Pine County

CONSOLIDATED COPPER MINES (Ely)—Churn-drill operations on the area between the Morris shaft and Reipetown have disclosed the presence of an ore deposit beginning not far below the surface of what was considered valuable only for dumping overburden. A number of holes have been put down there recently, which resulted in finding ore 38 to 40 ft. from the surface, and recently one of the holes had reached a depth of 360 ft. and was still in ore. This ground is where one of the steam-shovel pits will be opened in the near future, according to the statement from the management.

NEW JERSEY

Warren County

PAHAQUARRY COPPER CO.—This company has for nearly three years past been operating the old Pahaquarry mine near the Delaware River. The returns have been small, and a floating debt of about $110,000 has accumulated. Last week, on application of some of the creditors, I. N. Beavers, of Reading, Penn., and George P. Young, of Belvidere, N. J., were appointed receivers for the company. At a meeting of the stockholders a proposal to assess the stock 20% was voted down. Another meeting is to be held. Nearly all the stock is owned in Northampton and Lehigh Counties in Pennsylvania and in Warren County in New Jersey. The mine has been worked at intervals for many years by different companies.

NEW MEXICO

Socorro County

ALBERTA MINING CO. (Mogollon)—This company owns a large acreage adjacent to the mother lode of the district and resumed work recently with a small crew. Plans are being matured for the extensive deveopment of the group at an early date.

ERNESTINE MINING CO. (Mogollon)—A large consignment of bullion, the cleanup for last half of September, was sent out week before last via motor truck. The mill treated 1225 tons of ore during the week. Contractors are making good progress sinking main shaft.

LINCOLN MINING & DEVELOPMENT CO. (Mogollon)—No. 1 winze in main adit is being sunk at rate of 10 ft. per week; the work is handicapped by a considerable inflow of water. Hand drilling is employed in three 8-hr. shifts. The management is contemplating the installation of a small compressor plant.

OREGON

Josephine County

THE GRANTS PASS RAILWAY COMMISSION has purchased the right-of-way, rails, ties and a locomotive owned by a small line and will use the material in the construction of the Grant's Pass-Crescent City R.R., which work is under way. Much mining work is being done aong the line of this road looking to transportation in the near future.

ALMEDA CONSOLIDATED MINES CO. (Galice)—Thomas S. Burley, the receiver for this property, states that he has the mine in good running order, the smelting plant has started to make matte, and the camp is prosperous looking. The two-ton automobile truck recently purchased is hauling matte to Merlin for shipment, making two round trips from the mine to the railroad daily. A number of trips have been made to Gold Hill for limerock for use in smelting. These trips cover a distance of 99 miles and are made in a day of 10 hours, over fairly good roads. The truck starts from Merlin in the morning, making the run to Gold Hill, loading, then back to Almeda, unloading the limerock and loading with matte, then to Merlin to the railway station. A large force of miners is at work in the mine.

Lane County

WEST COAST MINES CO.—It is announced that the men now in control of the stock of this company are William Zimmerman and A. C. Dixon, who have ample capital at hand to develop and operate the properties on a large scale.

Multnomah County

GOLD FOUND IN THE CITY PARK at Portland, a short time ago attracted much attention, but has proved to be only a pocket of rich quartz. It is stated that the quartz rock assayed over $1000 per ton in gold.

SOUTH DAKOTA

Lawrence County

DAKOTA—P. H. Bertschy, of Deadwood, has resumed work on his lease on the Dakota property, after being idle since the Lundberg, Dorr & Wilson mill suspended. Shipments of about 15 tons daily are being made to the New Reliance mill.

RATTLESNAKE (Galena)—A 20-stamp mill is being erected. The machinery was purchased from the North Star company, at Custer, and is being delivered. The equipment will include a first-class cyanide department. A large body of porphyritic ore has been opened, showing good milling gold. Electric power will be used.

MOGUL (Terry)—Excellent progress is being made on the new mill this company is erecting in Nevada gulch. Grading has been completed, and good headway is being made with foundations and retaining walls. The old plant at Pluma, which was damaged by fire, is being razed and all available material and machinery transferred to the site of the new plant.

Pennington County

BLACK HILLS TUNGSTEN—This company has recently completed a 50-ton concentrating plant for treating wolframite ores. Denver men are interested.

REINBOLD (Keystons)—Lithia ore is being shipped from this property to Jersey City for refining. The amblygonite of this district carries a good percentage of phosphoric acid, which enhances its natural value as a lithia mineral.

OTHO (Keystone)—At this property, a 150-ton concentrating mill is being built, which, it is hoped, will be in operation before the end of the year. Ore is disclosed in two tunnels. The values are largely in the galena, although there is some free gold. It is possible that a cyanide annex will be necessary.

HILL CITY MINING & DEVELOPMENT CO. (Hill City)—This company has recently purchased a steam mining outfit, consisting of double-drum hoist, compressor, pumps, boiler, drills, etc., and as soon as it can be installed, sinking will commence from the bottom of the 100-ft. shaft. It is planned to abandon this level and open a new level at a depth of 150 ft., and another at 300 ft. With the ore properly developed to these depths the company will erect a mill.

TENNESSEE

Polk County

THE CONTRACT WITH DUCKTOWN MINE OWNERS and the state has been formally signed. Under this contract the miners agree to set apart $16,500 per year to be awarded as damages to property owners in Georgia from the fumes of the smelting plants.

UTAH

Beaver County

SHIPMENTS FROM BEAVER COUNTY for September, exclusive of those from Newhouse and Frisco, were as follows. Moscow, 12 cars; Majestic, 28; Slag (Majestic), 8; Copper King, 1; Red Warrior, 3; total, 52 cars.

MAJESTIC (Star District)—The new shaft on the Hoosier Boy is down 70 ft. Sinking is to be continued to a depth of 200 ft.; this will make the new work 50 ft. deeper than the earlier workings from which a good tonnage was mined. On the 200 drifting will be done for the vein, which it is expected will be reached in about 30 ft.

Summit County

PARK CITY SHIPMENTS for the week ended Oct. 3 amounted to 3,051,580 lb., this being the heaviest output in several months. During the week ended Oct. 10 a total of 3,373,770 lb. was shipped, the Silver King Coalition, Daly-Judge, and Daly-West each having shipped over 500 tons.

THOMPSON-QUINCY (Park City)—Some shipments of first-class ore are being made, while second-class ore is being sent to the Daly-West mill. Most of the ore is coming from development work. A drift to the east from one of the raises shows 3 ft. of first-class ore in places.

ONTARIO (Park City)—The ore recently opened on the 1500 level is being followed by raising, and is reported to be opening up well between the 1400 and 1500. It is thought that a vein parallel to the old productive Ontario fissure has been cut. The country rock in this part of the camp is entirely quartzite.

Salt Lake County

COLUMBUS EXTENSION (Alta)—Operations have been suspended.

UTAH LEASING (Bingham)—A cave-in at the old Telegraph mine now being worked by this company, recently imprisoned two miners, who were rescued uninjured after five hours' digging.

LAST CHANCE—This property has recently been acquired by the U. S. Smelting, Refining & Mining Co. It consists of 14 patented claims lying between the Utah Copper and United States properties. There are three tunnels on the property, the longest of which is 3200 ft. The former owners were the old Nevada-Utah Mines Corporation.

Utah County

ABOUT 2 FT. OF SNOW FELL in the upper cañon during the recent storms at American Fork. The ore-shipping season, however, is not yet over, as there is much good weather still in October and November. Considerable work is being done at various properties.

WASHINGTON

Ferry County

SUMMIT (Orient)—Operations at this mine have been resumed and the main shaft will be sunk to the 100-ft. level.

LAURIER (Laurier)—Some fine ore has been encountered and preparations are being made for regular shipments to the smelters.

CANADA

British Columbia

GRANBY CONSOLIDATED (Grand Forks)—After carrying the larger part of the burden of the management of the corporation since it was organized in 1899, Jay P. Graves, for years vice-president and general manager of the company, has relinquished active duties. At the recent annual meeting of the company, in New York, F. M. Sylvester, who has been assistant general manager the last year, was promoted to the position of manager and also was given a position on the executive board. Failing health is assigned by Mr. Graves as the reason for his relinquishment of the management, but he still retains the position of vice-president and will be actively associated with the company in an advisory capacity. He endeavored to be relieved at the annual meeting a year ago, but his fellow directors prevailed upon him to remain in command of operations until the Hidden Creek smelting works and development projects were advanced well toward completion.

Ontario

ORE SHIPMENTS over the Timiskaming & Northern Ontario Ry. for September totalled 1603 tons as follows: Bailey Cobalt, 20; Crown Reserve (24.90) by Dominion Reduction Co. (28.24), 53.1b; Coniagas, 205.68; Cobalt Comet, 43.04; Cobalt Townsite, 126.36; Cobalt Lake, 127.68; Hudson Bay, 124.62; Kerr Lake (113.59) by Dominion Reduction Co. (17.41), 131; La Rose, 171.08; McKinley-Darragh, 292.57; Nipissing, 128.97; Peterson Lake, 29.64; Penn Canadian, 27.93; O'Brien, 74.14; Tretheway, 47.71; 1,603.56 tons.

WETTLAUFER (Cobalt)—A cave-in of rock between the 300- and 400-ft. levels occurred week before last and wrecked the shaft. Arrangements have been made to close down at the end of the month.

MEXICO

Chihuahua

AMERICAN SMELTING & REFINING—Operations in Mexico are still greatly curtailed. At only three of the five centers of the company's activity in the country are the plants running. The Chihuahua plant is operating at 80% of capacity, that at Aguascalientes at about 50% capacity, and at Monterey at about one-third capacity. The Velardeña and Matehuala plants are ready to resume operations as soon as railroads are in shape to bring ore from the mines and make bullion shipments.

Federal District

AMERICANS ARE LEAVING THE CITY, states a news dispatch as a result of private warnings received from friends in the United States. Persons who received these messages said they were apparently based on alleged inside information of impending trouble.

Jalisco

TWO AMERICANS WERE KILLED, according to dispatches from Mexico City, dated Oct. 17. The victims were Thomas Barrett and William Kendall. Barrett was killed with an ax by a Mexican. The murderer was captured through the efforts of Kendall and another American, A. L. Johns. He was condemned to death, but his friends gathered, rescued the prisoner and shot Kendall to death. All the other Americans at the mines, 25 in number, were besieged at the mines for 45 hr. before the Federal troops came to their aid. It is not stated what mines are meant.

Sonora

EL TIGRE (Esqueda)—The diamond drill has struck a rich body of ore at a depth of 300 ft. The ore does not show on surface, and except by drilling, would not have been discovered. The drill was started July 1, and has been running steady ever since.

GERMANY

THE KRUPP WORKS at Essen were damaged by fire, which destroyed the steam-hammer section of the plant, Oct. 19. All the machinery was ruined. It is stated that the company will build branch works in Canada.

AFRICA

Transvaal

GOLD PRODUCTION IN SEPTEMBER was: Witwatersrand, 676,411 oz.; outside districts, 29,775 oz.; total Transvaal, 706,186 oz., which is 9910 oz. less than in August. For the nine months ended Sept. 30, the total was 6,813,880 oz. in 1912, and 6,730,092 oz. or $139,111,000 in 1913, a decrease of 83,798 oz. this year, which was entirely due to the miners' strike. The September output is the smallest reported since February, 1912. The number of negro mine laborers reported at the close of September was 174,319, a decrease of 6312 during the month.

AUSTRALIA

Queensland

MOUNT MORGAN (Mount Morgan)—Since B. Magnus took over the general managership of the mine he has been investigating the matter of coke supply, and has found a suitable coal property in Central Queensland at Blackwater, 120 miles from the mine. He is now investigating in Germany and England byproduct coke ovens, as the demand for sulphate of ammonia in Australia is steadily growing. By making coke at the company's mine in Queensland a saving can be made of £40,000 per annum now spent in freight on coke. Next year Mr. Magnus hopes to go to America to investigate the Hall process, as he anticipates that by the end of next year the process will have been tried out on a practical scale. If the process is successful and is applied to the Mount Morgan plant the sulphur recovery will not alone relieve the plant of smoke trouble, but the sulphur will be a valuable byproduct on account of the large amount of superphosphate making that is now carried on in Australia.

THE MARKET REPORT

METAL MARKETS

NEW YORK—Oct. 22

The metal markets here have been for the most part quiet, with few changes and only a moderate demand. In London there was some excitement in copper, chiefly due to the Rio Tinto strike.

Copper, Tin, Lead and Zinc

Copper—A distinctly better feeling became manifest in the copper market on Oct. 16, when some fair sales were made for shipment to Europe at about 16⅜c. delivered over there, or about 16.17½c. here. These sales continued into Friday and Saturday at gradually advancing prices. On Oct. 20 a rather sharp demand developed and sales were made at 16.45 cash, New York, by the end of the day. The buying was well distributed among a rather long list of consumers, indicating that the European need for copper is general. Some of the most important interests figured in this list. Up to this time there was scarcely any buying by domestic consumers. On Oct. 21 there was a further advance, 16.75c., delivered, usual terms, becoming the price firmly established, and on that basis some small sales were negotiated with domestic consumers. There were indications on this day and the following day that they would shortly become more generally interested.

The sales of the week of Oct. 16-22 were larger than for many weeks previous, and ran in the aggregate to millions of pounds, anyway to upward of 15 million. Three of the large agencies met the market. Two continued to hold out for the old asked price of 16⅞c., delivered, and became even more confident of its ultimate realization, although up to the close copper was otherwise available at 16¾c. However, some small sales at 16⅞c. were reported, to European "outports," whither the freight is about 10c. higher than ordinarily.

There was no change in the market for Lake cpoper, the price of which continues noncompetitive and nominal.

Casting copper was again rather pressed for sale.

The electrolytic copper in second hands and in those of the smaller producers has now been pretty well cleaned up, and at the close it looks as though consumers would have to look to the larger producers, who for some time past have been holding for 16⅞c., delivered at buyers' works, 30 days, for their supplies. The statistical position of the metal continues to improve, the supplies in Europe during the first half of October again showing a decrease. Electrolytic at the close is quoted at 16.55@16.60c., while casting copper is quoted nominally at 16@16¼c. as an average for the week.

The London standard market has been active and strong, due principally to bear covering. On Thursday, Oct. 16, spot was £72 11s. 3d.; three months, £72 8s. 9d. The next day the market was about 15s. higher. On Monday spot was £74 7s. 6d. and three months £74 2s. 6d. The following day it advanced 10s. and closed on Wednesday, Oct. 27, at £75 for spot and £74 7s. 6d. for three months.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17½@18c., carload lots at mill.

Visible Stocks of Copper in Europe on Oct. 15 are reported as follows: Great Britain, 14,180; France, 3100; Rotterdam, 2600; Hamburg, 1210; Bremen, 1040; other European ports, 1050; total, 23,180 long tons, or 51,923,200 lb. This is a decrease of 1060 tons from the Sept. 30 report. In addition to the stocks above 1350 tons are reported afloat from Chile and 3300 from Australia, making a total of 27,830 tons.

Cable reports are that all, or nearly all, of the workmen at the Rio Tinto mines went on strike Oct. 16, and that work is entirely suspended.

Tin—The advance which set in in the London market on Oct. 16, did not bring the expected response from this side, and was therefore only short-lived. Domestic consumers are buying their immediate wants only and have absolutely no interest in futures, which are freely offered at about ¼c. per lb. below import price. The market displayed a sagging tendency, but became firmer at the close, quotations being £185 10s. for spot and £186 for three months, and 40½c. for October tin here.

Lead—On Thursday, Oct. 16, the A. S. & R. Co. reduced its price at New York to 4.35c. The other producers also reduced their prices during the week, and the market has been 4.15@4.20c. St. Louis and 4.30@4.35c. New York.

The foreign market is slightly firmer, Spanish lead being quoted at £20 7s. 6d. and English lead £1 higher.

Spelter—The market is quiet. Consumers continue to buy from hand to mouth, notwithstanding the fact that prices have again reached a point where production of ore is being interfered with. There has been some more speculative interest in the article, which closes at 5.10@5.20c. St. Louis and 5.25@5.35c. New York.

Abroad good ordinaries are quoted £20 10s. and specials £21 per ton.

The base price of sheet zinc in carload lots on Oct. 16 declined 25c. per 100 lb. to $7.50 per 100 lb. less 8% discount, f.o.b. cars Peru, Ill., extras and discounts unchanged.

DAILY PRICES OF METALS

NEW YORK

Oct.	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb	St. Louis, Cts. per lb.	New York, Cts. per lb.	St Louis, Cts. per lb.
16	4.8550	61½	*16¾	16.15	40⅞	4.35	4.15	5.25	5.10
			@17	@16.20		@4.35	@4.20	@5.30	@5.15
17	4.8550	61½	*16¾	16.15	40⅝	4.30	4 15	5.25	5.10
			@17	@16.30		@4.35	@4.20	@5.30	@5.15
18	4.8525	61⅜	*16¾	16.25	40⅝	4.30	4.15	5.25	5.10
			@17	@16.35		@4.35	@4.20	@5.30	@5.15
20	4.8520	61½	*16¾	16.35	40½	4.30	4.15	5.25	5.10
			@17	@16.45		@4.35	@4.20	@5.30	@5.15
21	4.8550	61⅝	*16¾	16.55	40⅜	4.30	4.15	5.25	5.10
			@17	@16.60		@4.35	@4.20	@5.30	@5.15
22	4.8535	61	*16¾	16.55	40⅛	4.30	4.15	5.25	5.10
			@17	@16.60		@4.35	@4.20	@5.35	@5.20

*Nominal.

The quotations herein given are our appra'sal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Oct.	Silver	Copper				Tin		Lead		Zinc	
		Spot		3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton Ton	Cts. per Lb.
		£ per Ton	Cts. per Lb.								
16	28¼	72 9/16	15.76	72 7/16	78½	186¾	187	20½	4.37	20½	4.45
17	28¼	73¼	15.91	73⅛	79	185¾	185¾	20⅜	4.43	20½	4.45
18	28¼	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
20	28 5/16	74⅜	16.16	74⅛	80	184½	185¼	20½	4.45	20½	4.45
21	28¼	74⅞	16.27	74½	81	183⅞	184⅜	20½	4.45	20½	4.45
22	28 3/16	75	16.29	74¾	81	185½	186	20⅜	4.43	20½	4.45

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. Lead prices are for soft Spanish; Zinc prices for good ordinaries. For convenience in comparison of London with American prices, the ratio is: £1 per ton = 0.2173c. per lb., approximately, Cols., 3, 9 and 11 give the equivalent in cts. per lb. of the London price.

Exports and Imports of Metals, other than iron and steel, in the United States, seven months ended July 31, are reported as follows:

	Exports		Imports	
Metals:	1912	1913	1912	1913
Copper, long ton	214,117	246,614	105,437	105,962
Tin, long tons	344	792	31,012	28,911
Lead, short tons	42,688	35,046	55,011	43,022
Zinc, short tons	6,180	7,525	3,100	5,537
Zinc in ore, lb.	13,420,634	10,224,121	15,631,149	19,058,825
Nickel, lb.	15,672,944	17,621,110	22,083,095	27,684,342
Antimony, lb.	40,992	54,754	9,419,726	10,904,685
Aluminum, lb.	211,036	27,925	11,453,636	17,260,222
Quicksilver, lb.	13,770	30,936	.....	.....
Platinum, oz.	.....	1,191	56,302	73,306
Ores, etc.:				
Zinc oxide, lb.	20,357,197	17,753,398	.....	.....
Zinc doors, lb.	403,918	56,696	.....	.....
Zinc dust, lb.	24,971	88,313	365,680	2,582,270
Zinc ores, tons	13,766	10,132	23,026	18,534

Copper, lead, nickel and antimony include the quantities of metal in ores, matte, bullion, etc. Quantity of antimony ore is not given. Zinc dust was not given separately last year. The exports include reëxports of foreign material.

Other Metals

Aluminum—The market is not active for spot, though there is more demand for futures. Quotations are steady at 20@20½c. per lb. for No. 1 ingots, New York.

Antimony—There is a good jobbing business forward. Quotations are about the same as last week. Cookson's is 7.50@7.60c. per lb.; Hallett's 7¼@7⅜c.; while 6¼@6½c. is asked for Hungarian, Chinese and other outside brands.

Quicksilver—Business is fair and prices rather firmer. New York quotations are $39 per flask of 75 lb., with 56c. per lb. for retail lots. San Francisco, $38.50 for domestic orders; special terms for export. London, £7 5s. per flask, with £7 quoted from second hands.

Gold, Silver and Platinum

Gold—The price of gold on the open market in London remained at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Some gold was taken for India, but the demand for Egypt has fallen off.

Iridium—The price continues about the same, dealers and importers getting $83@85 per oz., New York.

Platinum—The market is rather steadier and there is less variation in prices. Quotations may be given at $44@45 per oz. for refined platinum. Hard metal is steady, $49@52 per oz. being asked.

Our Russian correspondent writes under date of Oct. 9 that the platinum market is in a strong position. Offers of metal have been important, but the demand is strong, especially for small lots, and all offers of lower prices have been rejected by sellers. Such stocks as exist are in strong hands. Current quotations at Ekaterinburg are 9.50 rubles per zolotnik—equal to $35.72 per oz.—for crude metal, 83% platinum; at St. Petersburg, 36,400@36,500 rubles per pood—equal to $35.72 per oz.—for the same grade.

Silver—Under date of Oct. 10, London advices state, that the continuance of big shipments to India—this being the third consecutive week in which a million sterling has been shipped—gives the market a healthy appearance.

Shipments of silver from London to the East, Jan. 1 to Oct. 9, as reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India	£8,124,200	£7,188,000	D. £ 936,200
China	993,500	652,000	D. 341,500
Total	£9,117,700	£7,840,000	D. £1,277,700

Pixley & Abell report as follows: "Another £1,000,000 has been shipped to India this week, making £3,000,000 in all. Two shipments of £250,000 each from Shanghai, of which the second has been made this week, may also be destined for the Indian Mints. Should this be so the Government has already secured £3,500,000 for coinage."

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Oct. 18

The base price paid this week for 60% zinc ore was $40@42 per ton. The base price paid for 80% lead ore was $55 per ton.

SHIPMENTS WEEK ENDED OCT. 18

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,459,470	61,000	811,300
Year to date	118,875,030	5,477,340	47,264,840

Shipped during week to separating plants, 1,718,240 lb. zinc ore.

JOPLIN, MO.—Oct. 18

The high price of zinc blende is $46, the base per ton of 60% zinc $40@43 for choice grades. Calamine is unaffected by the decline in blende, and is still quoted at $21@23 per ton of 40% zinc. The average of all grades is $39.14 per ton. Lead ore declined $2 per ton, being quoted at $52 for ores carrying 80% metal. The average of all grades is $52.28 per ton.

SHIPMENTS WEEK ENDED OCT. 18

	Blende	Calamine	Lead	Value
Totals this week.	9,788,340	713,990	.....	$252,995
Totals 42 weeks..	458,992,890	33,626,150	75,839,500	$12,519,544

Blende value, the week, $196,820; 42 weeks, $10,062,066.
Calamine value, the week, $8450; 42 weeks, $433,534.
Lead value, the week, $47,720; 42 weeks, $2,023,939.

IRON TRADE REVIEW

NEW YORK—Oct. 22

Little change is reported in the iron trade. Orders for finished material are being limited to actual requirements as far as possible, probably in the expectation of some readjustment of prices. Mills generally are still busy and there has been little or no reduction in running time or forces.

Bookings of steel orders have undergone some further decrease, and to such an extent that a slight further decrease in production has been forced, since the majority of the mills are depending chiefly upon current orders for their operations. Steel production in the country as a whole is now averaging 85 to 90% of full capacity, and probably nearer 85%, with the outlook for further restriction from week to week.

Steel prices have continued to show a sagging tendency, cutting rates being more pronounced. Plates are openly quotable this week at 1.30c., making the third recession of $1 a ton in this commodity, while bars and shapes have become quite unsteady.

The views of some leading steel manufacturers have undergone a modification in the past week or two, in the direction of expecting a greater recession in activity than was at first recognized. While the fact is not openly admitted there is reason for believing that manufacturers have little hope of any definite revival before January at the earliest.

Pig iron is in fair demand, but chiefly on orders of moderate size. Foundry iron is in better demand. Prices remain fairly firm.

PITTSBURGH—Oct. 21

A few days ago one of the smaller local plate mills began offering plates freely at 1.30c., or $1 a ton under the quotation recognized last week as representing the market, though the price even then was occasionally shaded Some of the larger mills immediately decided that the competition would have to be met. On bars it is only a question of time until the price yields, while structural shapes can hardly remain long above plates.

Most of the mills have for several weeks been able to make prompt shipment of bars, plates and shapes, and in the past fortnight one mill just east of Pittsburgh has been particularly aggressive in soliciting even very small orders at regular mill prices, for immediate shipment. This has cut into the ordinary trade of the local warehouse of the Carnegie Steel Co. to such an extent that the absurd report was started that the warehouse was actually closed.

Pig Iron—A sale of No. 2 foundry at $13.75, and of gray forge at $13.40, Valley, are the lowest prices yet made on the present weakening. Basic has moved in small tonnages at $14, Valley. Bessemer is quite inactive. We continue to quote: Bessemer, $15.75; basic, $14; No. 2 foundry, $13.85@14; gray forge, $13.50; malleable, $14.25, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market is quiet, and there are reports of cutting to the extent of at least 50c. We quote the regular market for prompt and forward at $50, Baltimore.

Steel—An evidence of the uncertainty existing as to where the market really stands is furnished in the fact that the Carnegie Steel Co. is not making this week the usual announcement it makes to contract customers as to its price for next month's deliveries. Next week it will submit to its contract customers prices at which it will book specifications for November delivery of billets and sheet bars. In the open market it is difficult to determine precisely what could be done, but there is justification in reducing last week's quotations 50c., to $22.50 for billets, $23.50 for sheet bars, and $26 for rods, at maker's mill, Pittsburgh or Youngstown.

Exports and Imports of Iron and Steel and of machinery in the United States eight months ended Aug. 31 are valued as below by the Bureau of Statistics of the Department of Commerce:

	1912	1913	Changes
Exports	$190,413,532	$203,650,894	I. $13,237,362
Imports	18,509,065	23,287,336	I. 4,778,271
Excess, exports	$171,904,467	$180,363,558	I. $ 8,459,091

The gain in exports was 7%; the increase in imports 25.8%.

Pig Iron in Germany in August is given by the German Iron & Steel Union at 1,638,824 metric tons, being 8894 tons less than in July. For the eight months ended Aug. 31, the total make was, in metric tons:

	1912	1913	Changes
Foundry iron	2,168,180	2,441,769	I. 273,589
Forge iron	354,795	337,461	D. 17,334
Steel pig	1,406,024	1,711,477	I. 308,453
Bessemer pig	256,806	241,558	D. 15,248
Thomas (basic) pig	7,414,374	8,121,943	I. 707,569
Total	11,597,179	12,854,208	I.1,257,029

IRON ORE

The question of rates on iron ore from Lake Erie ports to furnaces has been reopened by order of the Interstate Commerce Commission. The whole subject is to be investigated, including the arrangement of rate districts and the reasonableness of rates charged.

Imports and Exports of Iron Ore in the United States eight months ended Aug. 31, long tons:

	1912	1913	Changes
Imports	1,358,821	1,621,309	I. 262,488
Exports	729,080	595,841	D. 133,239

The chief imports this year were 1,024,080 tons from Cuba, 237,082 from Sweden, 125,273 from Newfoundland and Labrador and 104,786 tons from Canada.

Imports of Iron Ore into Great Britain nine months ended Sept. 30 were 4,845,923 long tons in 1912, and 5,774,354 in 1913; an increase of 928,431 tons, or 19.2%, this year.

COKE

Connellsville coke production continues steady. Shipments have been large until this week, but some trouble has arisen as to the supply of cars.

Exports and Imports of Fuel in the United States eight months ended Aug. 31, long tons:

	Exports		Imports	
	1912	1913	1912	1913
Anthracite	2,186,330	2,847,443	30	30
Bituminous	9,668,352	11,834,511	1,025,388	919,418
Coke	556,583	607,767	61,156	46,802
Bunker coal	4,943,257	4,892,706	.....	.....
Total	17,354,522	20,192,427	1,086,574	966,250

The bunker coal, or coal furnished to steamships in foreign trade is practically all bituminous. The largest exports are to Canada. Imports are chiefly on the Pacific Coast and in the far Northwest. Increase in exports was 2,837,905 tons, or 16.4%; decrease in imports, 120,324 tons, or 11.1%, this year.

CHEMICALS

NEW YORK—Oct. 22

Business generally is much quieter than it has been, in nearly all lines.

Arsenic—Business is absolutely dead for the time being. There is no buying and no pressure to sell, though stocks are sufficient. Prices, at $3 per 100 lb., are nominal.

Copper Sulphate—The market is steady and fairly active. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

Potassium Salts—Exports of potassium salts from Germany for the half-year ended June 30 were, in metric tons:

	1912	1913	Changes
Crude salts	609,399	758,749	I. 149,359
Potassium chloride	150,285	191,601	I. 41,316
Potassium sulphate	45,519	68,234	I. 22,715
Pot.-magnesium sulphate	38,126	41,859	I. 3,733
Totals	843,320	1,060,443	I. 217,123

Of the total this year 496,437 tons were exported to the United States.

Nitrate of Soda—The full effect of the reaction abroad—to which reference was made last week—is now being felt. Business is duller than for many years. Prices are rather weak at 2.25c. per lb. for October, 2.30c. for November and December and 2.35c. for January-May delivery.

NEW CALEDONIA ORES

Exports of ores from New Caledonia for the eight months ended Aug. 31, as reported by the "Bulletin du Commerce" of Noumea, were 55,005 metric tons of nickel ore and 32,564 tons of chrome ore. Exports of metals in August were 292 tons of nickel matte, an increase of 65 tons over July.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	May	June	July	August	September
Alaska shipments	1,771,508	2,203,191	2,705,136	1,847,785	2,261,216
Anaconda	25,600,000	21,500,000	22,100,000	22,500,000	22,600,000
Arizona, Ltd.	3,200,000	2,600,000	2,600,000	1,800,000	1,800,000
Copper Queen	8,301,605	7,477,936	8,369,607	8,252,404	.....
Calumet & Ariz.	4,300,000	4,000,000	3,800,000	4,500,000	4,000,000
Chino	3,883,611	3,682,706	4,831,185	6,050,867	4,308,296
Detroit	2,001,633	1,750,601	1,549,224	2,187,223	.....
East Butte	1,268,595	1,055,646	1,060,257	1,162,007	1,233,018
Giroux*	625,000	610,000	610,000	605,000	.....
Mason Valley	1,186,560	1,097,014	908,892	867,060	.....
Miami	1,943,900	2,612,000	.....	.....	.....
Mammoth	1,700,000	1,750,000	1,800,000	1,750,000	1,750,000
Nevada Con.	5,933,275	6,344,863	5,403,919	5,989,973	.....
Ohio	650,071	537,400	601,700	689,000	685,900
Old Dominion	2,749,006	2,511,000	2,526,000	2,524,000	2,679,000
Ray	4,384,400	4,392,612	4,097,000	4,269,519	.....
Shannon	1,080,000	924,000	880,000	1,248,000	1,232,000
South Utah	200,000	185,000	140,000	223,498	241,843
Tennessee	§1,037,115	1,379,220	1,247,804	1,101,019	1,309,950
United Verde*	3,000,000	2,900,000	3,000,000	3,000,000	.....
Utah Copper Co.	10,003,227	11,637,949	9,849,043	10,302,251	11,462,905
Lake Superior*	18,705,000	16,500,000	17,500,000	9,700,000	6,950,008
Non-rep. mines*	6,300,000	6,000,000	6,200,000	6,200,000	.....
Total prod.	109,824,500	104,051,138	101,758,167	96,769,606	.....
Imports, bars, etc.	22,205,942	18,255,267	29,029,990	22,474,471	.....
Total blister	132,030,442	122,306,405	130,788,157	119,244,077	.....
Imp. ore & matte	10,528,562	7,497,002	8,527,046	9,171,351	.....
Total Amer.	142,559,004	129,803,407	139,315,203	128,415,428	.....
Miami†	.....	.....	2,890,000	3,097,500	2,688,000
Shattuck-Arizona	1,026,170	1,059,625	1,019,388	1,001,634	1,163,237
Brit. Col. Cos.:					
British Col. Cop.	618,076	634,238	618,379	.....	.....
Granby	1,782,570	1,789,000	1,664,102	1,847,344	1,824,659
Mexican Cos.:					
Boleo†	2,424,800	1,984,640	2,240,720	2,264,640	.....
Cananea	2,272,000	2,908,000	3,328,000	3,186,000	3,148,000
Moctezuma	2,695,881	3,438,793	2,693,006	3,542,047	.....
Other Foreign:					
Braden, Chile	1,150,000	1,804,000	1,046,000	1,572,000	1,332,000
Cape Cop., S. Af.	387,520	414,400	.....	.....	.....
Kyshtim, Russia	1,490,000	1,000,000	2,500,000	1,585,000	.....
Spassky, Russia	721,280	835,520	660,800	1,048,320	.....
Exports from					
Chile	3,584,000	5,824,000	9,856,000	8,736,000	5,600,000
Australia	7,840,000	7,616,000	10,304,000	7,720,000	6,944,000
Arrivals–Europe‡	13,661,760	5,277,440	11,728,640	14,624,960	9,661,120

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

‡ Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

STATISTICS OF COPPER

	United States			Visible Stocks.		
Month	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
IX, '12	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I, 1913	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III	136,251,849	76,585,471	77,699,306	122,302,890	81,244,800	203,547,690
IV	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI	121,860,853	68,362,571	68,067,901	67,474,225	77,235,200	144,709,425
VII	138,074,602	58,904,192	78,480,071	52,814,606	71,904,000	124,808,606
VIII	131,632,362	73,649,801	73,263,469	53,594,945	66,420,480	120,015,385
IX	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X	.....	.....	.....	29,793,094	53,625,600	83,418,694

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq.	Sale	Amt.
Arizona Enterprise, Ariz.	Oct. 10	Oct. 31	$0.005
Big Elk, Ida.	Oct. 13	Nov. 5	0.001
Carlin-Nevada, Nev.	Oct. 25	Nov. 11	0.001
Cop. Mountain, Ida. (postp'd)	Sept. 6	Nov. 4	0.002
Crown Point, Nev.	Oct. 20	Nov. 12	0.10
Demijohn Cons., Utah	Oct. 17	Nov. 4	0.0025
Emerald, Utah	Oct. 15	Nov. 8	0.005
Eureka, Utah	Oct. 21	Nov. 11	0.001
Hypotheek, Ida.	Oct. 9	Nov. 4	0.004
Lost Josephine, Utah	Oct. 17	Nov. 6	0.002
Lower Mammoth, Utah	Oct. 17	Nov. 7	0.01
Montello, Utah	Oct. 11	Nov. 1	0.005
Moonlight, Ida.	Sept. 30	Oct. 30	0.005
Raymond-Illinois, Utah	Oct. 11	Oct. 27	0.005
Reinder, Ida.	Oct. 20	Nov. 7	0.003
Royal Copper, Ida.	Sept. 29	Oct. 29	0.001
Santaquin Chief, Utah	Oct. 13	Oct. 31	0.0025
Santaquin King, Utah	Oct. 9	Oct. 27	0.0025
Sunrise, Ida.	Sept. 28	Oct. 28	0.002
Sunset, Ida.	Oct. 18	Nov. 12	0.002
Tar Baby, Utah	Sept. 29	Nov. 3	0.0025
Tintic Standard, Utah	Oct. 11	Nov. 1	0.005
Utah-Arizona, Ariz.	Oct. 15	Oct. 31	0.005
Utah United, Utah	Oct. 11	Nov. 1	0.01
West Century, Utah	Oct. 1	Oct. 30	0.01
Western Star, Ida.	Oct. 23	Nov. 8	0.002
Wisconsin, Ida.	Oct. 9	Nov. 10	0.002

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59.490	24.595	27.284	27.416
May	53.308	60.880	60.361	24.583	28.038	27.825
June	53.043	61.290	58.990	24.486	28.215	27.199
July	52.630	60.654	58.721	24.286	27.919	27.074
August	52.171	61.606	59.293	24.082	28.375	27.335
September	52.440	63.078	60.640	24.209	29.088	27.986
October	53.340	63.471	.....	24.594	29.299	.....
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	53.304	60.835	.....	24.592	28.042	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York				London Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16.767	62.760	71.741
February	14.084	14.971	14.329	15.253	62.893	65.519
March	14.698	14.713	14.868	14.930	65.884	65.329
April	15.741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16.245	15.738	72.352	68.807
June	17.234	14.672	17.443	14.871	78.259	67.140
July	17.190	14.190	17.353	14.563	76.636	64.166
August	17.498	15.400	17.644	15.904	78.670	69.200
September	17.508	16.328	17.698	16.799	78.762	73.125
October	17.314	.....	17.661	.....	76.389	.....
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.140
March	42.577	46.832	192.619	213.615
April	43.923	49.115	200.513	224.159
May	46.063	49.038	208.830	224.143
June	45.815	44.820	205.863	207.208
July	44.519	40.260	202.446	183.511
August	45.857	41.582	208.351	188.731
September	49.135	42.410	223.762	193.074
October	50.077	.....	228.353	.....
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3.946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	4.381	4.118	4.242	16.331	17.597
May	4.194	4.342	4.072	4.226	16.509	18.923
June	4.392	4.325	4.321	4.190	17.588	20.226
July	4.720	4.353	4.603	4.223	18.544	20.038
August	4.569	4.624	4.452	4.550	19.655	20.406
September	5.048	4.698	4.924	4.579	22.292	20.648
October	5.071	.....	4.894	.....	20.630	.....
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6.089	26.661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	5.641	6.483	5.491	25.644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	5.124	6.727	4.974	25.763	22.143
July	7.116	5.278	6.966	5.128	26.174	20.592
August	7.028	5.658	6.878	5.508	26.443	20.706
September	7.454	5.694	7.313	5.544	27.048	21.148
October	7.426	.....	7.276	.....	27.543	.....
November	7.371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26.494	.....
Year	6.943	.....	6.799	.....	26.421	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.35	$14.00	$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	17.90	13.90	16.71	14.15	16.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	17.14	14.11	15.40	14.22	15.10
July	15.15	16.31	14.38	15.13	14.38	14.74
August	15.43	16.63	14.90	15.00	14.85	14.88
September	16.86	16.65	16.03	15.04	15.63	14.93
October	17.90	.....	17.18	.....	17.22	.....
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	$16.01	.....	$14.93	.....	$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS Oct. 21

Name of Comp.	Bid.
Acacia	.02½
Cripple Cr'k Con.	.01
C. K. & N.	.09
Doctor Jack Pot	.06
Elkton Con.	.52
El Paso	2.90
Findlay	.01½
Gold Dollar	.06
Gold Sovereign	.02½
Isabella	.09½
Jack Pot	.05
Jennie Sample	.05½
Jerry Johnson	.03½
Lexington	‡.005
Moon Anchor	‡.006
Old Gold	.01
Mary McKinney	.52
Pharmacist	.01½
Portland	.95½
Vindicator	.85

SALT LAKE Oct. 21

Name of Comp.	Bid.
Beck Tunnel	.05
Black Jack	.09½
Cedar Talisman	.00½
Colorado Mining	.10½
Columbus Con.	.01
Crown Point	.00½
Daly-Judge	5.50
Grand Central	.52
Iron Blossom	1.05
Little Bell	‡.10
Lower Mammoth	.00½
Mason Valley	3.25
May Day	.05½
Nevada Hills	.75
New York	.02½
Prince Con.	.28½
Silver King Coal'n	3.50
Sioux Con.	.01
Uncle Sam	.02
Yankee	.08

TORONTO Oct. 20

Name of Comp.	Bid.	Name of Comp.	Bid.
Bailey	.07	Foley O'Brien	.18
Coniagas	7.00	Hollinger	16.80
T. & Hudson Bay	‡70.00	Imperial	‡.02
Timiskaming	.15	Jupiter	.10
Wettlaufer-Lor.	.05	Pearl Lake	.11
Apex	‡.01	Porcu. Gold	.12
Big Dome	9.75	Preston E. D.	.01
Crown Chartered	‡.00½	Rea	.12
Dobie	.10	Swastika	.02
Dome Exten.	.06	West Dome	.08

SAN FRANCISCO Oct. 21

Name of Comp.	Bid	Name of Comp.	Bid
Comstock Stocks		Misc. Nev. & Cal.	
Alta	.05	Belmont	7.17½
Belcher	‡.21	Jim Butler	.60
Best & Belcher	.05	MacNamara	.10
Caledonia	1.25	Midway	.31
Challenge Con.	.07	Mont.-Tonopah	1.15
Chollar	.02	North Star	.37
Confidence	.33	West End Con.	1.30
Con. Virginia	.10	Atlanta	.11
Crown Point	.29	Booth	.01
Gould & Curry	.02	C.O.D. Con.	.03
Hale & Norcross	.06	Comb. Frac.	.03
Mexican	1.12½	Jumbo Extension	.08
Occidental	.70	Pitts.-Silver Peak	.40
Ophir	.16	Round Mountain	.40
Overman	‡.50	Silver Pick	.03
Potosi	.02	Tramp Con	‡.01
Savage	.11	Argonaut	3.50
Sierra Nevada	.05	Bunker Hill	1.50
Union Con.	.08	Central Eureka	.19
Yellow Jacket	.27	So. Eureka	‡2.00

N. Y. EXCH. Oct. 21

Name of Comp.	Clg.
Amalgamated	76½
Am. Agri. Chem.	44½
Am.Sm.&Ref.,com.	65½
Am. Sm. & Ref., pf.	100
Am. Sm. Sec., pf. B	81½
Anaconda	36½
Batopilas Min.	1½
Bethlehem Steel,pf.	70
Chino	41½
Federal M. & S., pf.	37½
GreatNor.,ore,ctf.	33½
Guggen. Exp.	45½
Homestake	105½
Inspiration Con.	15½
Miami Copper	22½
Nat'l Lead, com.	44½
National Lead, pf.	105
Nev. Consol.	15¾
Phelps Dodge	188
Pittsburg Coal, pf.	90
Quicksilver, pf.	3
Ray Con.	19½
Republic I&S,com.	20
Republic I&S, pf.	81½
SlossSheffi'd,com.	28
Sloss Sheffield, pf.	86
Tennessee Copper	29½
Utah Copper	54½
U. S. Steel, com.	59
U. S. Steel, pf.	107
Va.Car.Chem.,pf.	94

N. Y. CURB Oct. 21

Name of Comp.	Clg.
Ariz. Belmont	.15
Barnes King	1⅞
Beaver Con.	.30
Big Four	.20
Braden Copper	7¾
B. C. Copper	2⅜
Buffalo Mines	2⅛
Can. G. & S.	.17
Caribou	.58
Con. Ariz. Sm.	3/16
Davis-Daly	2⅛
Diam'field-Daisy	.02
Ely Con.	.06
Florence	.20
Giroux	1½
Gold Hill Con.	3/16
Goldfield Con.	1 7/16
Greene Cananea	.28
Greenwater	.05
Internat. S. & R.	‡115
Kerr Lake	3 15/16
Keystone	‡1½
La Rose	2 1/16
McKinley-Dar-Sa.	1⅞
Min. Co. of A. new	2½
Nipissing Mines	8⅜
Ohio Copper	½
Pacific Sm. & M.	‡⅛
Puebla S. & R.	3
South Utah M&S.	3/16
Stand'd Oil of N.J.	380
Stewart	1 9/16
Tonopah	4½
Tonopah Ex.	1 13/16
Tonopah Merger	.61
Tri-Bullion	⅛
Tularosa	11/16
Union Mines	.04
United Cop., pfd.	3
Yukon Gold	2

LONDON Oct. 15

Name of Comp.	Clg.
Camp Bird	£0 15s 6d
El Oro	0 14 6
Esperanza	0 17 6
Mexico Mines	5 10 0
Oroville	0 6 3
Santa Gert'dis.	0 18 9
Stratton's	0 1 6
Tomboy	1 6 3

BOSTON EXCH Oct. 21

Name of Comp.	Clg.
Adventure	1½
Ahmeek	280
Alaska Gold M.	23½
Algomah	1½
Allouez	34½
Am. Zinc	18½
Ariz. Com., ctfs.	5 5/16
Bonanza	.30
Boston & Corbin	.75
Butte & Balak	3½
Calumet & Ariz.	64½
Calumet & Hecla	420
Centennial	13
Cliff	1½
Copper Range	37½
Daly West	2
East Butte	12½
Franklin	3
Granby	73½
Hancock	15
Hedley Gold	29½
Helvetia	.75
Indiana	3½
Island Cr'k, com.	47½
Island Cr'k, pfd.	84
Isle Royale	19
Keweenaw	1½
Lake	‡8½
La Salle	3½
Mass.	2
Michigan	1½
Mohawk	40
New Arcadian	1½
New Idria Quick	2½
North Butte	24½
North Lake	1 7/16
Ojibway	.50
Old Dominion	50½
Osceola	77
Quincy	57
Shannon	6½
Shattuck-Ariz.	28½
Superior	23½
Superior & Bost.	2½
Tamarack	28½
Trinity	4½
Tuolumne	.70
U. S. Smelting	.38
U. S. Smelt'g, pf.	46½
Utah Apex	2
Utah Con.	9
Victoria	1½
Winona	1½
Wolverine	41½
Wyandot	.50

BOSTON CURB Oct. 21

Name of Comp.	Bid
Bingham Mines	5½
Boston Ely	.48
Butte&Lon'nDev.	.32
Cactus	.02
Calaveras	1 5/16
Chief Cons.	1 5/16
Corbin	.80
Cortez	.20
Crown Reserve	1½
Eagle & Blue Bell	1
First Nat. Cop.	3½
Houghton Copper	3½
Majestic	.25
Mexican Metals	.49
Moneta Pore	‡.07
Nevada-Douglas	1½
New Baltic	.60
Oneco	.85
Raven Copper	.06
Rhode Island Coal	.01
Smokey Dev.	.75
So. Lake	3½
S. W. Miami	‡1½
Tonopah Victor	.25
Trethewey	.28
United Verde Ext.	.50

‡Last Quotation.